

A

0
0
0
6
0
6
9
6
5
2



UC SOUTHERN REGIONAL LIBRARY FACILITY

California
Regional
Library Facility

$$\begin{array}{r}
 150 \\
 7163 \\
 \hline
 177 \overline{) 3} \underline{10}
 \end{array}$$

W. R. Leggett

Dec 20 1910

UCSB LIBRARY

X-63102

JAPANNING AND ENAMELLING

A HANDBOOK
ON
JAPANNING AND ENAMELLING

*FOR CYCLES, BEDSTEADS, TINWARE,
ETC.*

BY
WILLIAM NORMAN BROWN,

AUTHOR OF
"THE ART OF ENAMELLING ON METAL," "A HISTORY OF DECORATIVE ART,"
"HOUSE DECORATING AND PAINTING," "PRINCIPLES AND
PRACTICE OF DIPPING, BURNISHING,
LACQUERING, AND BRONZING
BRASSWARE," ETC.

FOUR ILLUSTRATIONS.

LONDON
SCOTT, GREENWOOD & CO.
8 BROADWAY. 49 LUDGATE HILL, E.C.

1901

D. VAN NOSTRAND COMPANY,
NEW YORK

PRINTED BY
MORRISON & GIBB LIMITED
EDINBURGH

PREFACE

IN writing the following pages, I have had in view the requirements more particularly of the small tradesmen in our country towns, who, in consequence of the advances made during the past few years in the cycle industry, are often called on to do a job, and that at short notice, when, owing to their lack of apparatus and want of knowledge, they are compelled to send their work to Birmingham or London, at an additional delay and consequent expense. Another reason which impelled me to the writing of this little handbook was the fact that, so far as I have been able to ascertain, no similar work was in existence, and as there must be many tradesmen who would willingly fit up their own japanning plant if they only knew how, I trust to such my pages will commend themselves, as well as to others. With these few words of explanation and introduction, I leave my work in the reader's hands.

W. N. B.

LONDON, *October* 1901.

CONTENTS

	PAGE
A FEW WORDS ON ENAMELLING	11
APPLIANCES AND APPARATUS	14
JAPANS OR ENAMELS	15
TO TEST ENAMEL FOR LEAD	16
JAPANNING OR ENAMELLING METALS	16
JAPANNING TIN, SUCH AS TEA-TRAYS AND SIMILAR GOODS	20
ENAMELLING OLD WORK	21
ENAMEL FOR CAST-IRON	22
GLASS ENAMEL FOR IRON	23
ENAMEL FOR COPPER COOKING UTENSILS	24
THE ENAMELLING STOVE	24
ENAMELLING BEDSTEAD FRAMES AND SIMILAR LARGE PIECES	28
PAINTS AND VARNISHES FOR METALLIC SURFACES	30
BLACKING FOR IRON	33
VARNISHES FOR IRONWORK	35
PROCESSES FOR TIN PLATING	36
GALVANISING	39
METAL POLISHES	43
COLOURS FOR POLISHED BRASS	44
A GOLDEN VARNISH FOR METAL	46
PAINTING ON ZINC	46
CARRIAGE VARNISH	46
JAPANESE VARNISH AND ITS APPLICATION	47
INDEX	50

ILLUSTRATIONS



	PAGE
FIG. 1.—DOOR OF OVEN WHEN SHUT	26
„ 2.—SHOWING STOVE WHEN OPEN, AND BACK OF DOOR	27
„ 3.—BUNSEN BURNER	28
„ 4.—TROUGH FOR DIPPING BEDSTEAD FRAMES AND OTHER LARGE WORK	29

JAPANNING AND ENAMELLING

A FEW WORDS ON ENAMELLING

IN enamelling metals the enamel is fused by heat upon the surface of the object, and is incorporated by fusion with its surface. Enamel for metals must therefore be indestructible by heat. A good enamel for coating iron utensils must firmly adhere to the surface, withstand slight shocks, and be capable of resisting changes of temperature and chemical influences. There are two kinds of enamel—the transparent and opaque. The first is the base of all the coloured enamels, which are produced by adding some metallic oxide to this transparent flux. The transparent enamel is produced by fusing the following materials, which are first ground, then dried, fused, and again ground for use:—Three parts siliceous sand, one part chalk, three parts calcined borax or three parts broken crystal glass, a quarter part of nitre, and one part diaphoretic antimony, well washed. Colours are obtained by adding to this transparent enamel the following materials, according to the colour desired:—Blue enamel, by adding oxide of cobalt, or some of its combinations, with the addition of a little nitre; black enamel, by peroxide of manganese or iron and a little cobalt. Clay produces, with about one-third protoxide of iron, a fine black enamel. Of course the worker will do well to have nothing to do with the preparation of any of the above, but they are here included to afford a knowledge only of the necessary constituents.

As is generally known, japanning is the art of covering paper, wood, or metal with a thick coating of hard and brilliant varnish. It originated in Japan—hence its name,—the natives of which used a gum extracted from a certain kind of tree, which on its issuing from the plant is of a creamy tint, but becomes black on exposure to the air. It is, of course, only in its application to metallic surfaces that we are concerned in these pages. Japanning may be said to occupy a position midway between painting and enamelling, and a japanned surface differs from an ordinary painted surface in being harder and more durable, and also in not being easily injured by hot water or in being placed near a fire; while real good japanning is demonstrated by its adhesiveness to the metal to which it has been applied, and its non-liability to chipping—a fault which, as a rule, stamps the common article.

Leaving the theoretical for the practical, it may here be remarked that since the beginning of the nineteenth century many attempts have been made to cover iron with a vitreous surface, and many patents have been taken out for such methods of enamelling, all of which were more or less failures. The chief difficulty in applying enamels to iron arises from the tendency of the metal to oxidise before it reaches the temperature at which the enamel fuses, and to become brittle from the oxide combining with the silica of the enamel. This action being superficial, the mischief is the greater in proportion to the thinness of the iron. Therefore it is much easier to enamel thick cast-iron vessels than thin vessels made of sheet-iron. A gloss may be made by combining either silicic acid or boracic acid with a base; the latter fuses at a lower temperature than the former, but the gloss is much dearer and not so durable as the silica gloss. The enamels used for coating iron consist of a mixture of silica and borax, with various basic substances, such as soda, oxide of tin, alumina, oxide of lead, etc. Lead is not, or ought not to be, used in the enamel for coating culinary vessels.

For the enamelling of cast-iron work, Wagner, in his *Chemical Technology*, gives the following account of another process:—"The surface of the cast-iron to be enamelled is first carefully cleaned by scouring with sand and dilute sulphuric acid; next a somewhat thickish magma, made of pulverised quartz, borax, felspar, kaolin, and water, is brushed over the clean metallic surface as evenly as possible, and immediately after a finely-powdered mixture of felspar, soda, borax, and oxide of tin is dusted over, after which the enamel is burnt in by the heat of a muffle." In France an enamel is applied which consists of 130 parts of flint glass, $20\frac{1}{2}$ parts of carbonate of soda, and 12 parts of boric acid, fused together, and afterwards ground to a fine powder. Experiments have, however, proved that some of the milk-white porcelainous enamel with which cast-iron cooking vessels are now so commonly prepared has a composition such as to render it highly objectionable on account of the facility with which it is acted upon by acid, fruits, common salt, and other ordinary dietetic substances, by which means lead, and even arsenic, is dissolved out in large quantity during the cooking processes.

Another black enamel for iron goods is that of M. Puscher, of Nuremberg, who some few years ago invented the following simple process, by which he claimed to cover iron and any other metals with a black coating similar to enamel, and very much more equal in thickness and regularity of distribution, as it is not laid upon the metal with a brush or any similar tool. The inventor places in a vase 18 inches high sufficient finely powdered coal to cover the bottom of the vessel to a depth of about three-quarters of an inch, and over this, at the height of about one inch, is placed a grating, which carries the objects to be treated. The vessel is then covered and luted down tightly, and placed upon a brisk fire. The vessel is at once filled with steam, which soon evaporates, and is then charged with bituminous vapour. The firing is maintained for about half an

hour, so that the bottom of the vessel is kept at dull red heat, after which it is removed, and, when cool, opened. The remainder of the coal is found in the form of coke, and the objects placed upon the grating, which have been at a fairly high temperature for a considerable time, are found to be covered with a black coating having all the appearances of enamel, but of extreme tenacity and a considerable degree of elasticity. Objects thus treated may be bent and exposed to great variations of temperature without in the least affecting the coating deposited on their surfaces. It is, in fact, a simple process for stove-blackening iron goods, and possesses the advantages and drawbacks of this method of treating metallic surfaces.

Another good black enamel for small articles can be made by mixing a pound of asphaltum with a pound of resin in four pounds of tar oil, well heating the whole in an iron vessel before applying.

A good brown japan can be prepared by separately heating equal quantities of amber and asphaltum, and adding to each one-half the quantity by weight of boiled linseed oil. Both compounds are then mixed together. Copal resin may be substituted for the amber, but it is not so durable.

APPLIANCES AND APPARATUS

Besides the various enamels or japons and varnishes of various colourings and the stove, which will be found described and illustrated, together with the trough, in other pages, the worker will need some iron pots or cauldrons in which to boil the potash "lye" for the cleansing more particularly of old work, some iron ladles both for this work and for pouring the japan on the articles to be covered therewith, a few badger tools and brushes for small fine work, some hooks for the stove, a pair of pliers, a few bits of broom handle cut into short lengths and made taper, so as to fit into the tubes, etc., of bicycles and other

work, so as to keep the hands as free from the japan as possible, some emery powder, pumice-stone powder, tripoli, putty powder, whiting, and a piece of felt or cloth. If he is also doing any common work, a stumpy brush of bristles and a soft leather will also be requisite, together with a file or two. These will about comprise the whole of the articles required, not very expensive, all of which will really not be required by a beginner.

JAPANS OR ENAMELS

The various japans or enamels all have as their groundwork shellac varnish, which is made by dissolving shellac in alcohol, and with which is incorporated the necessary pigment to produce the desired colour; and an improvement to the varnish can be procured by adding two ounces each of shellac and resin to a pint of methylated spirit. Although, as stated elsewhere, I do not advocate the manufacture of these enamels, as they can be purchased cheaper and better, I give a few recipes, as they may be useful to those who like to mix their own materials, or who may not be able to get the enamels. Thus for black, mix lampblack or ivory black—the latter for preference—with the above varnish; while another black can be made by melting one pound of asphaltum and mixing it with a pound of balsam of copaiba, thinning the compound to a workable consistency with hot oil of turpentine; and yet another black can be made by mixing lampblack with oil of turpentine, grinding smooth in a muller, and thinning with copal varnish. Then for white, take flake white or white lead, and grind it up with a sixth of its weight of starch, after which it must be thoroughly dried and mixed with mastic varnish. For yellow, King's yellow is usually used as the pigment, but the tone is very considerably improved by dissolving turmeric in the alcohol before adding the necessary shellac to form the varnish. For red japan, the ground is made up with madder

lake, carmine, or vermilion ground with oil of turpentine, which is employed for the first coating, the second being made of lake and white copal varnish. A green is obtained by using Prussian blue or distilled verdigris with King's yellow. Orange is gained by mixing vermilion or red lead with King's yellow or orange lake; and purple japan can be procured by mixing lake or vermilion with Prussian blue. A good copal varnish for jappanners is made thus: Take of pale African copal seven pounds, of pale drying oil half gallon, of oil of turpentine three gallons, which thoroughly fuse and mix in the usual manner. It dries in from twenty to sixty minutes, and may be polished as soon as it is hard, and particularly if stoved. All copal varnishes when properly made are very hard and durable, though less so than those of amber, but they have the advantage over the latter of being paler. They are used for carriages and metal work, and animé is frequently substituted for copal in the copal varnishes of the shops.

TO TEST ENAMEL FOR LEAD

For the simple and rapid detection of the presence of lead in the enamel of culinary vessels, apply a drop of concentrated nitric acid to the enamel of the vessel, after, of course, carefully cleansing it from all impurities, and afterwards thoroughly drying by gentle heating. Then moisten the spot which has been subjected to the action of the acid with a drop of sodium iodide, and the presence of lead will be shown by the formation of yellow iodide of lead. I have thought it well to include this test for lead in those pages, as from experiments made at different times enamelled culinary articles have been found to be so impregnated—a great danger to the consumer.

JAPANNING OR ENAMELLING METALS

In japanning metals, all good work of which should be stoved, they have to be first thoroughly cleaned, and then the

japan ground applied with a badger- or camel-hair brush or other means, very carefully and evenly. Metals usually require from three to five coats, and between each application must be dried in an oven heated from 250 degrees to 300 degrees Fahrenheit,—about 270 degrees being the average. The best grounds for japanning are formed of shellac varnish, the necessary pigments for colouring being added thereto, being mixed with the shellac varnish after they have been ground into a high degree of smoothness and fineness in spirits of turpentine. In japanning it is best to have the oven at rather a lower temperature, increasing the heat after the work has been placed in the oven. When a sufficient number of coats have been laid on—which will usually be two only—the work must be polished by means of a piece of cloth or felt dipped in tripoli or finely powdered pumice-stone. For white grounds fine putty powder or whiting must be employed, a final coat being afterwards given, and the work stoved again. The last coat of all is one of varnish. And here, as a preliminary remark, I would advise that all enamels and japans should be purchased ready-made, as any attempt to make such is almost sure to end in disaster, while, owing to the fact that such are only required for small jobs, it would involve too much trouble and would not pay. It is for this reason that I have only given a few japan recipes, as, although many are available, they do not always turn out as suitable for the purpose as could be desired, in addition to which the ready-made articles can be purchased at a very reasonable price and are much better prepared. I would recommend the operator to procure his enamels a shade or two lighter than he desires to see in the finished article, allowing the chemical action due to the stoving to tone the colours down. Another necessity is to keep the enamel thoroughly well mixed by well stirring it every time it is used, as if this is not done the actual colouring matter is apt to sink to the bottom, the ultimate result being that streaky

work is produced in consequence of this indifferent mixing of the enamelling materials.

It is hardly necessary to state that all japanning or enamelling work must be done in a room or shop absolutely free from dust or dirt, and as far away as possible from any window or other opening leading to the open air, for two reasons—one being that the draught therefrom may cool the oven or stove, and the other that the air may convey particles of dust into the enamelling shop. In fact, it cannot be too much impressed upon the workmen that one of the primary secrets of successful enamelling is absolute cleanliness; consequently all precautions must be taken to ensure that the enamel is perfectly free from grit and dust, and it must be so kept by frequent straining through fine muslin, flannel, or similar material. The work having been thoroughly cleaned and freed from all grease and other foreign matter, it must be suspended or held immediately over the pan elsewhere referred to, and the enamel poured on with an ordinary iron ladle, or covered by means of the brush. When it has been permitted to thoroughly drain, the work should be hung on the hooks on the rods in the oven as seen in the explanatory sketch, care being observed that no portion of the work is in such a position that any superfluous enamel cannot easily drain off,—in other words, the work must lie or hang that it is always, as it were, on the slant. Always bear in mind when shutting the oven door to do so gently, as if a slam is indulged in all the gas jets will be blown out, and an explosion would probably result.

Should the job in hand be a large one, it will be found as well to get a cheaper enamel for the first coat, but if the work is only a small job, it will not be necessary to have more than one enamel, of which a couple of coats at least will be required. When the first coat has thoroughly dried and hardened, the surface will have to be thoroughly rubbed till it is perfectly smooth with tripoli powder and fine pumice-stone, and after-

wards hand polished with rotten-stone and putty powder. And here it may be remarked that the finer the surface is got up with emery powder and other polishing agents the better will be the enamelling and ultimate finish. The rubbing down being finished, another coat of enamel must be applied and the work baked as before, care being always taken to keep the enamel in a sufficiently fluid condition as to enable it to flow and run off the work freely. It can easily be thinned with a little paraffin. A third coat will frequently be advisable, as it improves the finish.

In enamelling cycles, it is well to hang the front forks crown uppermost when they are undergoing the final baking, and it is advisable to bear in mind that wheels require an enamel that will stove at a lower temperature than is called for for other parts of the machine. Some japanners advocate the fluid being put on with camel- or badger-hair brushes, and for the best descriptions of work, final coats, and such like, I agree with them; but this is a detail which can be left to the operator's own fancy, the class of work, etc.; but I would remind him that applying enamel with a brush requires much care and a certain amount of "knack." It is something like successful lacquering in brasswork—it looks very simple, but is not; consequently do not venture on this method of working unless you feel quite confident as to the result. Each succeeding coat of japan gives a more uniform and glossy surface, and for this reason it may, in some cases, be necessary to repeat the operation no fewer than half a dozen times, the final coat being generally a layer of clear varnish only, to add to the lustre.

Care must be taken for light-coloured japans or enamels not to have the temperature sufficiently high to scorch, or the surface will be discoloured, as they require a lower temperature for fixing than the dark japans, which, provided the article is not likely to be injured by the heat, are usually dried at a

somewhat high temperature. The preceding instructions apply only to the best descriptions of work.

When pouring enamel by means of the ladle over pieces of work, do not agitate the liquid too much—at the same time taking care to keep it well mixed—so as to form air bubbles, as this will cause trouble, and in pouring over the work do it with an easy and gentle and not too hurried a motion. In japanning curved pieces, such as mud-guards, etc., in hanging up the work in the oven see that the liquid does not run to the extremities and there form ugly blots or blotches of enamel.

When white or other light tones are used for japanning they are mixed with japanners' varnish, and these require more careful heating in the oven or stove than darker tints or brown or black.

JAPANNING TIN, SUCH AS TEA-TRAYS AND SIMILAR GOODS

For japanning sheet-iron articles, which are really tin goods, such as tea-trays and similar things, first scour them well with a piece of sandstone, which will effectually remove all the scales and make the surface quite smooth. Then give the metal a coating of vegetable black, which must be mixed with black tar varnish, thinned with tar spirits, and well strained. Only a small quantity of this varnish is necessary, as it will dry dead. The article must then be placed in the stove to harden at a temperature of 212 degrees Fahrenheit, there to remain for from ten to twelve hours. When taken out of the stove, the articles must be allowed to get cold, after which they must be given a coat of black tar varnish, which, if necessary, must be thinned with tar spirits, a stiff, short bristle brush being employed, and the varnish put on sparingly, so that it will not "run" when it gets warm. Two coats of this varnish on top of the vegetable black coating are usually sufficient, when done

properly, but a third coating much improves the work, and from ten to twelve hours' hardening will be necessary between each coating. The small lumps which will be more or less certain to arise will require to be rubbed down between each application by a small and smooth piece of pumice-stone.

If it is desired to add gold or bronze bands or any kind of floral or other kind of fancy decorations, these are painted on, after the ground japanning has been done, in japanners' gold size, and then the gold leaf is applied, or the bronze or other metal powder is dusted on, after which the objects so treated are again placed in the stove, where they will not require to be kept near so long as for the ordinary japanning. After they have been removed, the gilt or bronzed portions must be treated with a protecting coat of white spirit varnish. Transfers can be applied in the same way.

Tinned iron goods are the most largely japanned, and for these brown and black colours are principally employed. Both are obtained by the use of brown japan, the metal having a preliminary coating of black paint when black is required. Only one coating of brown japan is given to cheap goods, but for better articles two or more are applied. For these a possible final dressing with pumice-stone and then with rotten-stone, to be finally rubbed with a piece of felt or cloth, or even the palm of the hand, may be necessary, but as a rule not.

Large numbers of articles of the above description, such as tea-trays, tea-canisters, cash-boxes, coal-boxes, and similar goods, are japanned at Birmingham, and it is to such that the preceding instructions apply.

ENAMELLING OLD WORK

In all cases of re-enamelling old work, it is absolutely necessary to remove all traces of the first enamelling, and if

this has been well done in the first instance, it will prove no mean job. The best way to clean the work is to soak it in a strong "lye" of hot potash, when the softened enamel can be wiped or brushed off,—this latter method being pursued in the more intricate and ungetatable portions of the work. New work, which has not been enamelled, can be treated in the same way for the removal of all grease, stains, finger-marks, etc., and too much attention cannot be paid to the initial preparation of the surface of the metal, to have it thoroughly even and smooth, as it adds so much to the ultimate finish and appearance of the work. Plenty of labour must be bestowed before the final coat, as any blemish will show through this finishing, and so mar what would otherwise be a highly satisfactory bit of work. In all kinds of bicycle work, whether new or old, the most satisfactory results are obtained by the application of at least two, and sometimes four or five, successive coats of good but thin enamel, as this will impart the necessary perfect coat, combined with durability, a high finish, and a good colour. A good enamel should be sufficiently hard, so as not to be scratched on the merest touch or rubbing. It will, of course, be understood that no solder-work must be put into the stove, or the pieces will separate. Should any of this work be discovered, the pieces must be taken apart, and then brazed together before being enamelled, and put in the stove.

ENAMEL FOR CAST-IRON

A very white and firmly adhering enamel for cast-iron articles can be made thus: Keep the articles at a red heat in sand for half an hour, then allow to cool off slowly, and cleanse with hot diluted sulphuric or hydrochloric acid, then rinse in water and dry. Next apply a ground mass composed of flint-glass, 4 parts; borax, 3 parts; minium, 1 part; oxide

of zinc, 1 part,—all finely powdered and roasted at a red heat for four hours, then rendered semi-fluid by increased temperature, then cooled in cold water and one part of it mixed with 2 parts of bone meal and made into a paste with water. When the coating in the article is dry, apply a surface coat composed of a mixture of 32 parts of calcined bones, 16 parts of china clay, 14 parts of felspar, 4 parts of potash, mixed with water, dried, cooled, and, when powdered, made into a paste with 16 parts of flint glass, $5\frac{1}{2}$ parts of calcined bones, and 3 parts of calcined quartz mixed with sufficient water. When this second coat is dry, apply a mixture composed of 4 parts of felspar, 4 parts of pure sand, 4 parts of potash, 6 parts of borax, 1 part of oxide of zinc, 1 part of saltpetre, 1 part of white arsenic, and 1 part of pure chalk, mixed, calcined, and cooled and rubbed to a fine powder with $3\frac{1}{2}$ parts of calcined bones and 3 parts of quartz. The coated articles are heated in a furnace, which fuses the last two coatings and forms an adhesive and brilliant white enamel. This is no doubt a very good formula, but unless the tradesman is in a very extensive way of business, I would not advise his going to the trouble to make it, but to purchase instead a good and reliable enamel.

GLASS ENAMEL FOR IRON

Kitchen utensils, etc., coated with this enamel are not affected by the atmosphere, fire, or rust. To make, mix intimately 4 parts of powdered glass, 2 parts of spar, 1 part of saltpetre, and $\frac{1}{4}$ of a part of zinc oxide. Fuse in a crucible, and pour into moulds to cool. For use, the necessary quantity is triturated with water. Heat the iron utensil to a red heat in a furnace, and apply the enamel, which will present a brilliant glassy appearance. To colour the enamel blue, add cobaltic oxide; for red, ammonium; for black, manganic

oxide; for yellow, uranic oxide; for brown, ferric oxide; for green, a mixture of 2 parts of stannic oxide and 1 part of manganic oxide; and for pure white, stannic oxide.

ENAMEL FOR COPPER COOKING UTENSILS

Powder and mix 12 parts of white fluorspar, 12 parts of unburned gypsum, and 1 part of borax, and fuse the mixture in a crucible. Pour the mass out, and when cold triturate it into a paste with water. Apply this with a brush to the inside of the vessel, and place the latter in a moderately warm place, so that the paste will dry uniformly. When dry, heat the vessel to such a degree in a stove that the paste which has been applied liquifies, and when cold the result will be a white opaque enamel. I do not advocate the manufacture of this by the workman, as the requisite enamel can be purchased. In another page I give a test for detecting lead in enamelled culinary articles.

In case any of the readers of this little volume should be called on to work in new copper goods, they will probably be glad to learn that a couple of coats of boiled linseed oil makes the best varnish for such work. The first coat must be thoroughly dry before the second coat is put on.

THE ENAMELLING STOVE

Owing largely to the strides made in the cycle trade, all enamelling is stoved by means of gas, and of this a plentiful supply is necessary. Enamelling stoves may really be described as hot-air cupboards or ovens, and for a stove which will answer most requirements—say one of 6 feet by 6 feet by $3\frac{1}{2}$ feet—six rows of atmospheric burners will be necessary to heat it, while it will be also advisable to fix pipes of

$1\frac{1}{4}$ inch internal diameter from the gas meter to the stove. The atmospheric burners can be made from the requisite number of pieces of $1\frac{1}{4}$ -inch gas tube $3\frac{1}{2}$ feet in length, one end of each being stopped, and having $\frac{1}{8}$ -inch holes drilled therein at intervals of about 1 inch, the other end being left open for the insertion of ordinary $\frac{3}{8}$ -inch brass gas taps. Another plan preferred by some japanners is to have three rows of burners the full length of the stove, which, under some circumstances, due to structural conditions, will be found more suitable. Anyway, whatever the position of the stove, allowance must be made for a temperature up to 400 degrees Fahrenheit to be raised. In old-fashioned ovens the heat is applied by means of external flues, in which hot air or steam is circulated, but this system is generally unsatisfactory, the supply of heat having to be controlled by dampers or stop-cocks, and this has given place to the gas apparatus. Another simple form of oven, though not one which I shall recommend, is a species of sheet-iron box, which is encased by another and larger box of the same shape, so placed that from two to three inches of interspace exists between the two boxes. To this interspace heat is applied, and a flue will have to be affixed to this apparatus to carry off the vapours which arise from the enamel or japan. For a permanent oven the example illustrated at Figs. 1 and 2 is about as good as any, though to guard against fire it would be as well to have a course of brick-work beneath the oven, while if this is not possible on account of want of height, a sheet or so of zinc or iron will help to mitigate the danger. It is also advisable, if the apartment is a low-pitched one, to have a sheet of iron or zinc suspended by four corner chains from the ceiling in order to protect this from firing through the heat from the enamelling oven. Of course, it will be understood that every portion of the stove must be put together with rivets, no soldered work being permissible.

To those who wish to construct their own stove, it will be found that the framework can be shaped out of one-inch angle iron, the panels or walls being constructed of sheet-iron of about 18 gauge, the whole being riveted together. The front will be occupied in its entire space by a door, which will require to be hung on strong iron hinges, and the framework of this door should be constructed of 1 inch by $\frac{1}{4}$ inch iron—

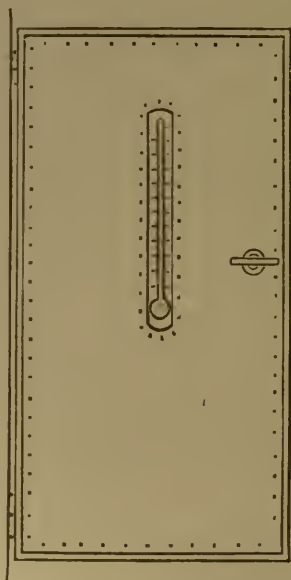


FIG. 1.—Door of Oven when shut.

a little stouter material will really be no disadvantage—to which the sheet-iron plates must be riveted. In the centre of the door must be cut a slit, say $1\frac{1}{2}$ inch by 9 inches, which will require to be covered with mica or talc, behind which must be placed the thermometer, so as it can be seen during the process of stoving, without the necessity of opening the

door, which, of course, more or less cools the oven. And, by the way, this thermometer must register higher than the highest temperature the oven is capable of reaching. Appended are two sketches of the stove, interior and exterior, which will give an idea of what a japanner's stove is like.

Inside the stove it will be necessary to fix rows of iron rods, some four inches from the top, from which to suspend the work,

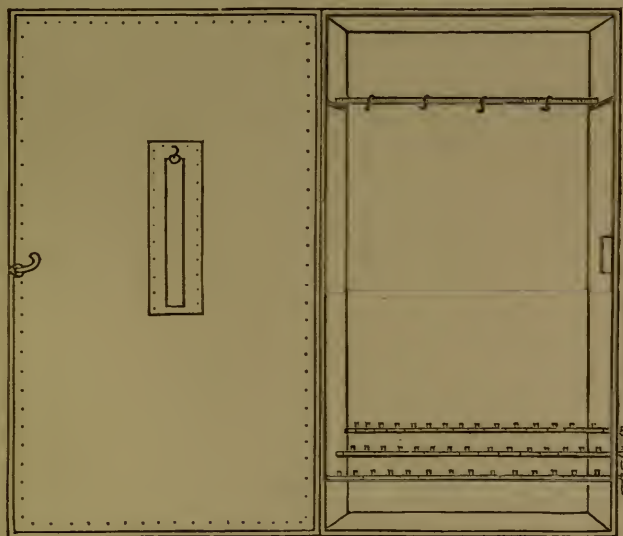


FIG. 2.—Showing Stove when open, and Back of Door.

or angle-iron ledges can be used on which the rods or bars can be fixed, these arrangements being varied according to the particular description of work, individual fancy, or other circumstances. Large S hooks are about the handiest to use. A necessary adjunct of the stove is a pan, which can be made by any handy man or tinworker, which should be made to fit the bottom of the stove, above the gas jets, it being arranged

that it rests on two side ledges, or along some rods. One a couple of inches in depth will be found sufficient, and it will repay its cost in the saving of enamel, it being possible with its use to enamel a bicycle with as little as a gallon of enamel. Some workmen have the tray made with a couple of hinged side flaps, to turn over and cover up the pan when not in use, but this is a matter of fancy. Of course, they must always be covered up when not in use. For those who would prefer to use Bunsen burners I show at Fig. 3 a sketch of the best kind to employ, these having three rows of holes in each.

When brick ovens are employed they must be lined with sheet-iron, and in these very rare circumstances where gas is not available, the stove can be heated with coal or wood, which



FIG. 3.—Bunsen Burner.

will, of course, involve a total alteration in the structural arrangements. I have not given the details here, as I do not think the necessity will ever arise for their use, and for the same reason I have refrained from giving the particulars for heating by steam and electricity, or the other methods which have been adopted by various workers, as there is no question but that a gas stove or oven, as described, is about the best and handiest for most descriptions of japanning work.

ENAMELLING BEDSTEAD FRAMES AND SIMILAR LARGE PIECES

At Fig. 4 is shown a trough in which large pieces, such as bedsteads, bicycle frames, etc., are dipped or immersed. For

the first mentioned class of work such high finish is not required as for bicycles, and consequently the enamel need not be applied with a brush, nor will it be necessary to rub down the work between each coat, but instead the pieces can be literally dipped in the tank of liquid, then allowed to drain on to the dripping-board,—the superfluous enamel thus finding its way back into the trough or tank, the dripped articles being afterwards placed in the oven to harden. The trough must be of sufficient dimensions to allow the pieces of work to be com-

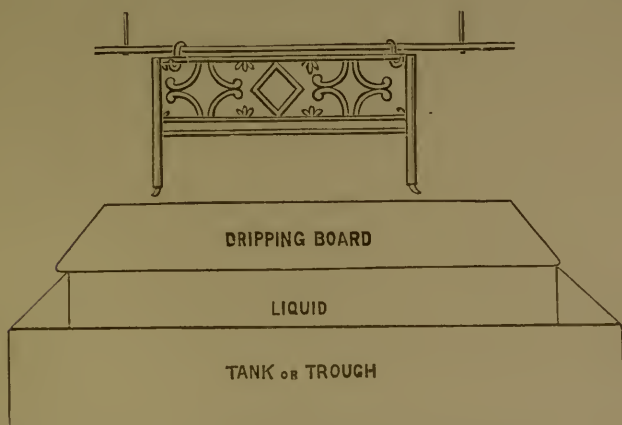


FIG. 4.—Trough for Dipping Bedstead Frames and other Large Work.

pletely immersed, and the dripping-board should be set at an angle of about forty-five degrees.

Bedstead frames will never require more than two coats, and the commoner class of goods only one. I would not advise the tradesman in a small way of business to go to the expense of a trough, etc., as it calls for much more room than is ordinarily available, but if he has the necessary plant for bicycle work he can, of course, do an occasional job of the other kind.

Common tin and ironware articles, such as cups, mugs, plates, etc., are usually only treated once, those articles which are to be enamelled outside and inside the same being dipped and then baked, the process being slightly varied for those which are white inside and another colour outside. For this description of work, blue, black, and brown are the most common colours employed, and a large quantity of this class of goods is turned out at Birmingham. As the enamelling of these articles hardly falls within the purview of this little work it will not be necessary to deal with them in any fuller detail.

PAINTS AND VARNISHES FOR METALLIC SURFACES

Ordinary oil paints consist of linseed oil, sometimes more or less adulterated, mixed by grinding with a pigment, which latter is usually a mineral substance reduced to a fine powder. The object of using a pigment, aside from its colour, is three-fold—(1) it hardens the film, which will thus better resist abrasion ; (2) it makes it possible to apply a thicker film, which also wears longer ; and (3) the particles of pigment tend to fill up the pores, which are naturally present in the oil film, and thus the porosity is reduced.

The pigments used for preservative paints are few in number as compared with those used in house and other decorative painting. They may be described briefly as follows:—White lead : this is a mixture of lead hydrate and carbonate, and this is sometimes sold as a dry pigment, but more frequently as paste white lead, which is nine parts dry pigment ground with one part by weight of raw linseed oil. This may be made into a paint by thinning it with oil, and usually a little turpentine is also added. The object of the latter is not to cheapen it,—indeed, at the present time turpentine is worth more than oil,—

but to make the work move freely under the brush and to increase the proportion of pigment in the film. This is a matter which it is very easy to overdo, and if too much turpentine is added, there will not be enough oil to act as cementing material for the pigment, which will then be easily removed.

White zinc is an oxide of zinc, white in colour, and it requires more oil than white lead. It is less opaque; its opacity or covering capacity is usually estimated at three-fifths that of white lead. Paint made with it does not readily brush off as a powder, but sometimes seems to come off in flakes. Painters say it peels or scales. It is commonly used mixed with white lead, and the mixture seems to be better than either substance alone. Paints made with these pigments are frequently, perhaps it may be said commonly, adulterated with other white powdered substances, such as kaolin and barytes, which are not particularly harmful, and whiting or carbonate of lime, which is actively injurious. While dry these substances appear white, but when mixed with oil they seem to be transparent. They are without value as pigments, and must be regarded as adulterants. White lead and white zinc are practically the only white pigments, and must form the basis of all light-coloured paints. Other light colours are made by adding some tinting material to them. The principal yellow colour is chromate of lead, or chrome yellow. This is a very brilliant colour, rather deep in shade, and the pale shades are made by adding white lead. Chrome green is a mixture of chrome yellow and Prussian blue, and is the only green pigment in common use. Prussian blue is a ferrocyanide of iron, dark blue in colour. The common light blue pigment is ultramarine blue, an artificial product of complex constitution, the exact composition and preparation of which are secret. The yellows, greens, and blues are not much used in paints for structural work, but this is not the case with red pigments, the most important of which are the oxides of iron. For this purpose

the sesquioxide, which is known in mineralogy as hematite, and the hydrated sesquioxide, or limonate, are used. Usually the two are mixed together in various proportions, the pigment being produced by grinding a natural oxide rock, which commonly contains from ten to sixty per cent. of other mineral matter, commonly silicates. The colour of these oxides varies from bright red to dark brown, the bright shades commonly containing most hydratic oxide, and the brown (rarely dark purple) shades being chiefly anhydrous; oxides of a bright purple or maroon tint are, however, hydrated. It is commonly believed that the brown or the dark red shades—that is, the anhydrous oxides—are more durable than the others. Some of these oxides are of artificial origin, such as Venetian red, which is a by-product originally containing some sulphuric acid, to neutralise which it has been saturated with lime; and in consequence the finished pigment contains a large percentage of sulphate of lime, which cannot be regarded as a desirable ingredient. A knowledge of the chemical constituents of an oxide pigment is therefore desirable. A considerable portion of silica, or of highly acid silicates, is probably not objectionable, especially if the product is nearly anhydrous; but if there is ground for believing that the silicates themselves are hydrated, they are simply clay, which is objectionable; and if any lime salts, soluble in water or acid, are present, the material is not suited for the purpose.

Oxide pigments are particularly open to the criticism of being, in many cases, not finely ground—a most serious objection. Any good paint should be so fine that it feels smooth and even when rubbed on glass or porcelain with a palette knife. The importance of fine grinding is not likely to be overestimated. Ochres, umber, and sienna are also classed with the iron oxide pigments, and usually contain a little manganese, which increases the drying qualities of the oil. They also contain various earthy colouring matters. The

ochres are yellow in colour, and the iron oxide in them is hydrated. They are often used in conjunction with white lead or zinc.

Carbon, in one form or another, is the base of all black pigments. By far the most common of these, as used in structural plants, is graphite. Other black pigments are lamp-black (including carbon black) and boneblack, the former being produced in many grades, varying in price from two-pence to half a crown per pound. Boneblack, which is refuse from the sugar-house black, varies in the percentage of carbon contained, which is usually about ten or twelve per cent., the remainder being the mineral matter originally present in the bone, and containing three or four per cent. of carbonate, whilst most of the remainder is phosphate of lime. Lampblack is an absolutely impalpable powder, which has a small amount of oily matter in it, and greatly retards the drying of the oil with which it may be mixed. For this reason it is not used by itself, but is added in small quantity to other paints, which it affects by changing their colour, and probably their durability. For example, it is a common practice to add it to red lead, in order to tone down its brilliant colour, and also to correct the tendency it has to turn white, due to the conversion of the red oxide of lead into the carbonate.

BLACKING FOR IRON

For colouring iron and steel a dead black of superior appearance and permanency, the following is a good formula:—1 part bismuth chloride, 2 parts mercury bi-chloride, 1 part copper chloride, 6 parts hydrochloric acid, 5 parts alcohol, and 50 parts lamp black, these being all well mixed. To use this preparation successfully—the article to be blacked or bronzed

being first made clean and free from grease—it is applied with a swab or brush, or, better still, the object may be dipped into it; the liquid is allowed to dry on the metal, and the latter is then placed in boiling water, the temperature being maintained for half an hour. If, after this, the colour is not so dark as is desired, the operation has simply to be repeated, and the result will be found satisfactory. After obtaining the desired degree of colour, the latter is fixed, as well as much improved generally, by placing for a few minutes in a bath of boiling oil, or by coating the surface with oil, and heating the object till the oil is completely driven off. The intense black obtained by this method is admirable.

Another black coating for ironwork, which is really a lacquer, is obtained by melting ozokerite, which becomes a brown resinous mass, with a melting-point at 140 degrees Fahrenheit. The melted mass is then further heated to 212 degrees Fahrenheit, the boiling-point of water. The objects to be lacquered are scoured clean by rubbing with dry sand, and are dipped in the melted mass. They are then allowed to drip, and the ozokerite is ignited by the objects being held over a fire. After the ozokerite has burned away, the flame is extinguished, and the iron acquires a firmly adhering black coating, which resists atmospheric influences, as well as acids and alkalies. If the black iron vessels are to contain alkaline liquids, the above operation is repeated.

A good cheap stock black paint or varnish for ironwork is prepared as follows:—Clear (solid) wood tar, 10 lb.; lamp-black or mineral black, $1\frac{1}{4}$ lb.; oil of turpentine, $5\frac{1}{2}$ quarts. The tar is first heated in a large iron pot to boiling-point, or nearly so, and the heat is continued for about four hours. The pot is then removed from the fire out of doors, and while still warm, and not hot, the turpentine, mixed with the black, is stirred in. If the varnish is too thick to dry quickly, add more turpentine. Benzine can be used instead of turpentine,

but the results are not so good. Asphaltum is preferable to the cheap tar.

To make another good black varnish for ironwork, take 8 lb. of asphaltum and fuse it in an iron kettle, then add 2 gallons of boiled linseed oil, 1 lb. of litharge, $\frac{1}{2}$ lb. of sulphate of zinc (add these slowly, or the mixture will boil over), and boil them for about three hours. Then add $1\frac{1}{2}$ lb. of dark gum amber, and boil for two hours longer, or until the mass will become quite thick when cool. After this it should be thinned with turpentine to the proper consistency.

VARNISHES FOR IRONWORK

A reliable authority gives the following as a very good recipe for ironwork varnish. Take 2 lb. of tar oil, $\frac{1}{2}$ lb. of pounded resin, and $\frac{1}{2}$ lb. of asphaltum, and dissolve together, and then mix while hot in an iron kettle, taking all care to prevent the flames getting into contact with the mixture. When cold the varnish is ready for application to outdoor ironwork. Another recipe is to take 3 lb. of powdered resin, place it in a tin or iron vessel, and add thereto $2\frac{1}{2}$ pints of spirits of turpentine, which well shake, and then let it stand for a day or two, giving it an occasional shake. Then add to it 5 quarts of boiled oil, shake it thoroughly well all together, afterwards letting it stand in a warm room till it gets clear. The clear portion can then be drawn off and used, or reduced with spirits of turpentine till of the requisite consistency. For making a varnish suitable for iron patterns, take sufficient oil of turpentine for the purpose of the job in hand, and drop into it, drop by drop, some strong commercial oil of vitriol, when the acid will cause a dark syrupy precipitate in the oil of turpentine, and continue to add the drops of vitriol till the precipitate ceases to act, after which pour off the liquid and wash the

syrupey mass with water, when it will be ready for use. When the iron pattern is to be varnished, it must be heated to a gentle degree, the syrupey product applied, and then the article allowed to dry.

A fine black varnish suitable for the covering of broken places in sewing machines and similar articles, where the japanned surface has become injured or scratched, can be made by taking some fine lampblack or ivory-black, and thoroughly mixing it with copal varnish. The black must be in a very fine powder, and to mix the more readily it should be made into a pasty mass with turpentine. For the ordinary repairing shop this will be found very handy.

The following is a simple way for tarring sheet-iron pipes to prevent rusting. The sections as made should be coated with coal tar, and then filled with light wood shavings, and the latter set alight. The effect of this treatment will be to render the iron practically proof against rust for an indefinite period, rendering future painting unnecessary. It is important, of course, that the iron should not be made too hot, or kept hot for too long a time, lest the tar should be burnt off.

Another varnish for coating iron, is compounded of 120 parts mercury, 10 parts tin, 20 parts green vitriol, 120 parts water, and 15 parts hydrochloric acid of 1·2 specific gravity.

The following is a varnish for iron and steel given by a recognised authority :—Five parts of camphor and elemi, 15 parts of sandarach, and 10 parts of clear grains of mastic, are dissolved in the requisite quantity of alcohol, and applied cold.

PROCESSES FOR TIN PLATING

In those days of making everything look what it is not, perhaps the best and cheapest substitute for silver as a white

coating for table ware, culinary vessels, and the many articles requiring such a coating, is pure tin. It does not compare favourably with silver in point of hardness or wearing qualities, but it costs very much less than silver, is readily applied, and can be easily kept clean and bright. In tinning hollow ware on the inside the metal article is first thoroughly cleansed by pickling it in dilute muriatic or sulphuric acid and then scouring it with fine sand. It is then heated over a fire to about the melting-point of tin, sprinkled with powdered resin, and partly filled with melted pure grain tin covered with resin to prevent its oxidisation. The vessel is then quickly turned and rolled about in every direction, so as to bring every part of the surface to be covered in contact with the molten metal. The greater part of the tin is then thrown out and the surface rubbed over with a brush of tow to equalise the coating ; and if not satisfactory the operation must be repeated. The vessels usually tinned in this manner are of copper and brass, but with a little care in cleaning and manipulating, iron can also be satisfactorily tinned by this means. The vessels to be tinned must always be sufficiently hot to keep the metal contained in them thoroughly fused. This is covering by contact with melted tin.

The amalgam process is not so much used as it was formerly. It consists in applying to the clean and dry metallic surface a film of a pasty amalgam of tin with mercury, and then exposing the surface to heat, which volatilises the latter, leaving the tin adhering to the metal.

The immersion process is the best adapted to coating articles of brass or copper. When immersed in a hot solution of tin properly prepared the metal is precipitated upon their surfaces. One of the best solutions for this purpose is the following :—

Ammonia alum	. . . . .	17 $\frac{1}{4}$ ounces.
Boiling water .	. . . . .	12 $\frac{1}{2}$ pounds.
Protochloride of tin	. . . . .	1 ounce.

The articles to be tinned must be first thoroughly cleansed, and then kept in the hot solution until properly whitened. A better result will be obtained by using the following bath, and placing the pieces in contact with a strip of clean zinc, also immersed :—

Bitartrate of potassia	14 ounces.
Soft water	24 „
Protochloride of tin	1 ounce.

It should be boiled for a few minutes before using.

The following is one of the best solutions for plating with tin by the battery process :—

Potassium pyrophosphate	12 ounces.
Protochloride of tin	4½ „
Water	20 „

The anode or feeding-plate used in this bath consists of pure Banca tin. This plate is joined to the positive (copper or carbon) pole of the battery, while the work is suspended from a wire connected with the negative (zinc) pole. A moderately strong battery is required, and the work is finished by scratch-brushing.

In Weigler's process a bath is prepared by passing washed chlorine gas into a concentrated aqueous solution of stannous chloride to saturation, and expelling excess of gas by warming the solution, which is then diluted with about ten volumes of water, and filtered, if necessary. The articles to be plated are pickled in dilute sulphuric acid, and polished with fine sand and a scratch brush, rinsed in water, loosely wound round with zinc wire or tape, and immersed in the bath for ten or fifteen minutes at ordinary temperatures. The coating is finished with the scratch-brush and whiting. By this process cast- or wrought-iron, steel, copper, brass, and lead can. be tinned without a separate battery. The only disadvantage of the process is that the bath soon becomes clogged up with zinc chloride, and the tin salt must be frequently removed. In Hern's process a bath composed of—

Tartaric acid	.	.	.	.	.	2 ounces
Water	.	.	.	.	.	100 „
Soda	.	.	.	.	.	3 „
Protochloride of tin	.	.	.	.	.	3 „

is employed instead of the preceding. It requires a somewhat longer exposure to properly tin articles in this than in Weigler's bath. Either of these baths may be used with a separate battery.

GALVANISING

Galvanising, as a protecting surface for large articles, such as enter into the construction of bridges, roofs, and shipwork, has not quite reached the point of appreciation that possibly the near future may award to it. Certain fallacies existed for a long time as to the relative merits of the dry or molten and the wet or electrolytical methods of galvanising. The latter was found to be too costly and slow, and the results obtained were erratic and not satisfactory, and soon gave place to the dry or molten bath process, as in practice at the present day; but the difficulty of management in connection with large baths of molten material, the deterioration of the bath, and other mechanical causes, limit the process to articles of comparatively small size and weight. The electro deposition of zinc has been subject to many patents, and the effects to introduce it have been lamentable in both a mechanical and financial sense. Most authorities recommend a current density of 18 or 20 ampères per square foot of cathode surface, and aqueous solutions of zinc sulphate, acetate or chloride, ammonia, chloride or tartrate, as being the most suitable for deposition. Electrolytes made by adding caustic potash or soda to a suitable zinc salt have been found to be unworkable in practice on account of the formation of an insoluble zinc oxide

on the surface of the anode and the resultant increased electrical resistance ; the electrolytes are also constantly getting out of order, as more metal is taken out of the solution than could possibly be dissolved from the anodes by the chemicals set free on account of this insoluble scale or furring up of the anodes, which sometimes reaches one eighth of an inch in thickness. To all intents and purposes the deposits obtained from acid solutions under favourable circumstances are fairly adhesive when great care has been exercised to thoroughly scale and clean the surface to be coated, which is found to be the principal difficulty in the application of any electro-chemical process for copper, lead, or tin, as well as for zinc, and that renders even the application of paint or other brush compounds so futile unless honestly complied with. Unfortunately these acid zinc coatings are of a transitory nature, their durability being incomparable with hot galvanising, as the deposit is porous and retains some of the acid salts, which cause a wasting of the zinc, and consequently the rusting of the iron or steel. Castings coated with acid zinc rust comparatively quickly, even when the porosity has been reduced by oxidation, aggravated no doubt by some of the corroding agents—sal-ammoniac, for instance—being forced into the pores of the metal. Other matters of serious moment in the electro-zincing process, apart from the slowness of the operation, were the uncertain nature, thickness, and extent of the coating on articles of irregular shape, and the formation of loose, dark-coloured patches on the work ; the unhealthy non-metallic look and want of brilliancy and lustre prevented engineers and the trade from accepting the process or its results, except for the commoner articles of use. To obviate any tendency of the paint to peel off from the zinc surface, as it generally manifests a disposition to do, it is recommended to coat all the zinc surfaces, previous to painting them, with the following compound :—1 part chloride of copper, 1 part nitrate of copper, 1 part sal-ammoniac, dissolved in 61 parts water, and then add

1 part commercial hydrochloric acid. When the zinc is brushed over with this mixture it oxidises the surface, turns black, and dries in from twelve to twenty-four hours, and may then be painted over without any danger of peeling. Another and more quickly applied coating consists of bi-chloride of platinum, 1 part dissolved in 10 parts distilled water, and applied either by a brush or sponge. It oxidises at once, turns black, and resists the weak acids, rain, and the elements generally.

Zinc surfaces, after a brief exposure to the air, become coated with a thin film of oxide—insoluble in water,—which adheres tenaciously, forming a protective coating to the underlying zinc. So long as the zinc surface remains intact, the underlying metal is protected from corrosive action, but a mechanical or other injury to the zinc coating that exposes the metal beneath, in the presence of moisture causes a very rapid corrosion to be started, the galvanic action being changed from the zinc positive to zinc negative, and the iron, as the positive element in the circuit, is corroded instead of the zinc. When galvanised iron is immersed in a corrosive liquid, the zinc is attacked in preference to the iron, provided both the exposed parts of the iron and the protected parts are immersed in the liquid. The zinc has not the same protective quality when the liquid is sprinkled over the surface and remains in isolated drops. Sea air, being charged with saline matters, is very destructive to galvanised surfaces, forming a soluble chloride by its action. As zinc is one of the metals most readily attacked by acids, ordinary galvanised iron is not suitable for positions where it is to be much exposed to an atmosphere charged with acids sent into the air by some manufactories, or to the sulphuric acid fumes found in the products of combustion of rolling mills, iron, glass, and gas works, etc., and yet we see engineers of note covering-in important buildings with corrugated and other sheets of iron, and using galvanised iron tie rods, angles, and other constructive shapes in blind confidence of the protective

power of the zinc coating; also in supreme indifference as to the future consequences and catastrophes that arise from their unexpected failure. The comparative inertia of lead to the chemical action of many acids has led to the contention that it should form as good, if not a better, protection to iron than zinc, but in practice it is found to be deficient as a protective coating against corrosion. A piece of lead-coated iron placed in water will show decided evidences of corrosion in twenty-four hours. This is to be attributed to the porous nature of the coating, whether it is applied by the hot or wet (acid) process. The lead does not bond to the plate as well as either of the other metals—zinc, tin, copper, or any alloys of them. The following table gives the increase in weight of different articles due to hot galvanising:—

Description of Article.	Weight of Zinc per Square Foot.	Percentage of Increase of Weight.
Thin sheet-iron .	1·196 ounces	18·2
$\frac{5}{16}$ -in. plates .	1·76 „	2·0
4-in. cut nails .	2·19 „	6·72
$\frac{7}{8}$ -in. die bolt and nut	approximately 1·206 ounces	1·00

Tin is often added to the hot bath for the purpose of obtaining a smoother surface and larger facets, but it is found to shorten the life of the protective coating very considerably.

A portion of a zinc coating applied by the hot process was found to be very brittle, breaking when attempts were made to bend it; the average thickness of the coating was ·015 inch. An analysis gave the following result:—tin, 2·20; iron, 3·78; arsenic, a trace; zinc (by difference), 94·02. A

small quantity of iron is dissolved from all the articles placed in the molten zinc bath, and a dross is formed amounting in many cases to 25 per cent. of the whole amount of zinc used. The zinc-iron alloy is very brittle, and contains by analysis 6 per cent. of iron, and is used to cast small art ornaments from. A hot galvanising plant, having a bath capacity of 10 feet by 4 feet by $4\frac{1}{2}$ feet outside dimensions, and about 1 inch in thickness, will hold 28 tons of zinc. With equal amounts of zinc per unit of area, the zinc coating put on by the cold process is more resistant to the corroding action of a saturated solution of copper sulphate than is the case with steel coated by the ordinary hot galvanising process; or, to put it in another form, articles coated by the cold process should have an equally long life under the same conditions of exposure that hot galvanised articles are exposed to, and with less zinc than would be necessary in the ordinary hot process. The hardness of a zinc surface is a matter of some importance. With this object in view aluminium has been added from a separate crucible to the molten zinc at the moment of dipping the article to be zinned, so as to form a compound surface of zinco-aluminium, and to reduce the ashes formed from the protective coverings of sal-ammoniac, fat, glycerine, etc. The addition of the aluminium also reduces the thickness of the coating applied. Cold and hot galvanised plates appear to stand abrasion equally well. Both pickling and hot galvanising reduce the strength, distort, and render brittle iron and steel wires of small sections.

METAL POLISHES

The active constituent of all metal polishes is generally chalk, rouge, or tripoli, because these produce a polish on metallic surfaces. The following recipes give good polishing soaps:—

(1) 20 to 25 lb. liquid and soap is intimately mixed with about 30 lb. of Swedish chalk and $\frac{1}{2}$ lb. Pompeian red. (2) 25 lb. liquid cocoanut oil soap is mixed with 2 lb. tripoli and 1 lb. each alum, tartaric acid, and white lead. (3) 25 lb. liquid cocoanut oil soap is mixed with 5 lb. rouge and 1 lb. ammonium carbonate. (4) 24 lb. cocoanut oil are saponified with 12 lb. soda lye of 38 to 40 degrees B., after which 3 lb. rouge, 3 lb. water, and 32 grms. ammonia are mixed in. Good recipes for polishing pomades are as follows:—(1) 5 lb. lard and yellow vaseline is melted and mixed with 1 lb. fine rouge. (2) 2 lb. palm oil and 2 lb. vaseline are melted together, and then 1 lb. rouge, 400 grs. tripoli, and 20 grs. oxalic acid are stirred in. (3) 4 lb. fatty petroleum and 1 lb. lard are heated and mixed with 1 lb. of rouge. The polishing pomades are generally perfumed with essence of myrbane. Polishing powders are prepared as follows:—(1) 4 lb. magnesium carbonate, 4 lb. chalk, and 7 lb. rouge are intimately mixed. (2) 4 lb. magnesium carbonate are mixed with 150 grs. fine rouge. An excellent and harmless polishing water is prepared by shaking together 250 grs. floated chalk, 1 lb. alcohol, and 20 grs. ammonia. Gilded articles are most readily cleansed with a solution of 5 grs. borax in 100 parts water, by means of a sponge or soft brush. The articles are then washed in pure water, and dried with a soft linen rag. Silverware is cleansed by rubbing with a solution of sodium hyposulphite.

COLOURS FOR POLISHED BRASS

The following are the formulæ for a variety of baths, designed to impart to polished brass various colours. The brass objects are put into boiling solutions composed of different salts, and the intensity of the shade obtained is dependent upon the duration of the immersion. With a solution com-

posed of sulphate of copper 120 grs., hydrochlorate of ammonia 30 grs., and water 1 quart, greenish shades are obtained. With the following solution, all the shades of brown, from orange-brown to cinnamon, are obtained :—Chlorate of potash 150 grs., sulphate of copper 150 grs., and water 1 quart. The following solution gives the brass first a rosy tint, and then colours it violet and blue :—Sulphate of copper 435 grs., hyposulphite of soda 300 grs., cream of tartar 150 grs., and water 1 pint. Upon adding to this solution ammoniacal sulphate of iron 300 grs., and hyposulphite of soda 300 grs., there are obtained, according to the duration of the immersion, yellowish, orange, rosy, and then bluish shades. Upon polarising the ebullition, the blue tint gives way to yellow, and finally to a pretty grey. Silver, under the same circumstances, becomes very beautifully coloured. After a long ebullition in the following solution, we obtain a yellow-brown shade, and then a remarkable fire-red :—Chlorate of potash 75 grs., carbonate of nickel 30 grs., salt of nickel 75 grs., and water 10 ounces. The following solution gives a beautiful dark brown colour :—Chlorate of potash 75 grs., salt of nickel 150 grs., and water 10 ounces. The following gives, in the first place, a red, which passes to blue, then to pale lilac, and finally to white :—Orpiment 75 grs., crystallised sal-sodae 150 grs., and water 10 ounces. The following gives a yellow-brown :—Salt of nickel 75 grs., sulphate of copper 75 grs., chlorate of potash 75 grs., and water 10 ounces. On mixing the following solutions, sulphur separates, and the brass becomes covered with iridescent crystallisations :—(1) Cream of tartar 75 grs., sulphate of copper 75 grs., and water 10 ounces. (2) Hyposulphite of soda 225 grs., and water 5 ounces. Upon leaving the brass objects immersed in the following mixture, contained in corked vessels, they at length acquire a very beautiful blue colour :—Hepar of sulphur 75 grs., ammonia 75 grs., and water 4 ounces.

A GOLDEN VARNISH FOR METAL

Take 2 ounces of gum sandarach, 1 ounce of litharge of gold, and 4 ounces of clarified linseed oil, which boil in a glazed earthenware vessel till the contents appear of a transparent yellow colour. This will make a good varnish for the final coating for enamelled and japanned goods.

PAINTING ON ZINC

Painting on zinc is facilitated by employing a mordant of 1 quart of chloride of copper, 1 of nitrate of copper, and 1 of sal-ammoniac, dissolved in 64 parts of water. To this mixture add 1 part of commercial hydrochloric acid. This is brushed over the zinc, and dries a dull grey colour in from twelve to twenty-four hours, paint adhering perfectly to the surface thus formed.

CARRIAGE VARNISH

The following is used for the wheels, springs, and carriage parts of coaches and other vehicles:—Take of pale African copal 8 lb., fuse, and add $2\frac{1}{2}$ gallons of clarified linseed oil; boil until very stringy, then add $\frac{1}{4}$ lb. each of dry copperas and litharge; boil, and thin with $5\frac{1}{2}$ gallons of oil of turpentine; then mix while hot with the following varnish, and immediately strain the mixture into a covered vessel. Gum animé, 8 lb.; clarified linseed oil, $2\frac{1}{2}$ gallons; $\frac{1}{4}$ lb. each of dried sugar of lead and litharge; boil, and thin with $5\frac{1}{2}$ gallons of turpentine; and mix it while hot as above directed. Of course these quantities will only do for big jobs, and as it has to do with metal, it has been thought advisable to include the formula in this handbook.

JAPANESE VARNISH AND ITS APPLICATION

As a fitting conclusion to these pages, a few remarks on the celebrated Japanese varnish, which is the basis and origin of all Western enamelling and japanning, may not be out of place here. The varnish is obtained from the tree known as *Rhus vernici ferr*, which is called by the Japanese *winini naki*, and grows to a height of 30 feet, and at the age of forty years has a trunk measuring 40 inches in diameter. It attains perfection at the age of fifteen years, and then produces its largest quantity of lac or varnish. This is obtained by making incisions in the bark in a horizontal direction, an operation that may be performed any time between April and October. Later in the year the lac is very thick and viscid, so that the collecting of it is attended by much greater difficulty. The lac tapper carries his own peculiar bow-shaped knife, made for the purpose, with which he cuts a short gash in the tree, and then draws the point of the knife through the cut again in order to remove any chips made by the first incision. This cut is made low down. On the opposite side of the trunk, a little farther up, he makes a second incision, and then on this side again, and so on, until he has made from six to ten cuts. After he has operated thus upon a dozen trees, the tapper returns to the first tree, and collects the fluid that has oozed from the incision, and which, at first milky white and thick, becomes, through exposure to the atmosphere, first dark brown, and finally quite black. This crude lac is known as *ki-urushi*. The tree is treated this way for from sixty to eighty days, when it dies. It is then cut down and the wood chopped up and put into hot water, which extracts the last remnant of the liquid, amounting to not more than half a pint, which forms the poorest quality of the lac. The fluid is then purified by filtering it through cotton stuff, grinding on a paint slab, and then elaborating the latter by heat. The finer sorts are bleached in shallow dishes in the sun.

The best kind is called *nashyi-urushi*, the poorer kind *hinki-urushi*, and the unbleached *jeshime-urushi*. The black varnish, *roiro-urushi*, is made from the crude lac. There are about twenty different kinds in the market, of which the above named are the most used.

The operation of varnishing is conducted in a very different manner from what it is with us. The Japanese apply their varnish mostly to woodwork; less frequently to copper and unglazed stoneware and porcelain. When applied directly to tinware the lacquer does not stick. When applied, the varnishes are generally brilliant black, dark coloured impure vermilion, impure dark green, or dark grey. Pure light colours and white cannot be produced with Japan varnish. The Japanese varnishers prepare their woodwork with the utmost care. The surfaces are smoothed and the chinks filled in with cement. The ground-coat is a mixture of the unbleached lac with paste, upon which is laid Japanese paper rubbed smooth with a brush and dried. Afterwards several very thin coats of the same varnish are applied, and each coat, after being well dried, is polished with Japanese carbon. The drying is done in a moist atmosphere, the apparatus used being a tight box whose sides are wet with water. After twenty-four hours one coat is dried, and if the article is to be black a coat of black varnish (*roiro-urushi*) is applied, but if it is to be grey or grey-brown, *jeshime-urushi* is used instead, and if it is to be red, the latter varnish is mixed with vermilion. The appearances of gold and pearl are obtained by mixing real gold dust or mother-of-pearl dust with the varnish, whereby a beautiful effect is produced. The article is then dried, rubbed down, and polished; and if there are gold, tortoise-shell, or mother-of-pearl decorations, a coat of azure varnish (*nashyi-urushi*) is applied. In applying their varnishes, the Japanese use broad brushes, the bristles of which are very stiff and inserted in wood, much in the way

that lead is in pencils. After much use the bristles get worn short, and the wood is then cut away just as in sharpening a pencil, thus exposing more of the bristles. A very fine piece of work receives no fewer than eighteen coats. These never fade with time, but rather improve, will stand a high temperature, and are totally unaffected by acids, spirits, and the like. The Japanese method is hardly likely to be introduced into Europe, because of the want of the natural material, which, when imported, becomes extremely costly, and because the process is tedious, but I have given the process here, as it may convey a wrinkle or two to workers at home.

INDEX

- AMALGAM process, 37.
Appliances required, 14.
Application of Japanese varnish, 47.
Atmospheric burners, 25.
- BATTERY process, plating with, 38.
Bedstead frames, enamelling of, 28.
Black cheap varnishes for iron-work, 34, 35.
Black enamel, 11, 14, 15.
Black enamel, Puscher's, 13.
Blackening (dead) for iron, 33.
Black pigments, 33.
Black tar varnish, 20.
Black varnish for repairing abrasions, 36.
Blue enamel, 11.
Blue, Prussian, 31.
Blues, reds, and violets for brass, 45.
Boneblack, 33.
Brass, brown for, 45.
Brass, green for, 44, 45.
Brass, polished, colours for, 44.
Brass, red, violet, and blue tints, 45.
Brass, yellow tints for, 45.
Brick ovens, 28.
Broken surfaces in sewing-machines, etc., black varnish for, 36.
Brown for polished brass, 45.
Brown japan, 14.
- Bunsen burners, best kind of, 28.
Burners, bunsen, best kind of, 28.
- CARBON, 33.
Carriage varnish, 46.
Cast-iron enamelling, 13.
Cast-iron, enamel for, 22.
Characteristics of zinc surfaces, 40, 41.
Cheap black varnishes for iron-work, 34, 35.
Chrome green, 31.
Chrome yellow, 31.
Cleansing gilded articles, 44.
Cleansing of silver, 44.
Cleansing old work, 22.
Cleanliness in enamelling, 18.
Coating with pure tin, 37.
Coats, number of, 19.
Colours for polished brass, 44.
Colouring glass enamel, 23.
Constructing stove, 26.
Construction of stove, 26.
Copal varnish, 16.
Copper cooking utensils, enamelling, 24.
Cycle enamelling, 19.
- DEAD black for iron and steel, 33.
Dry or molten methods of galvanising, advantages of, 39.
- ELECTROLYTES, 39, 40.
Electro-zincing process, difficulties in, 40.

- Enamelling of bedstead frames, 28.
 Enamelling cycles, 19.
 Enamelling old work, 21.
 Enamelling small tin and iron articles, 30.
 Enamelling stoves, 24.
 Enamels, composition of, 12.
 Enamel for cast-iron, 22.
 Enamel for copper utensils, 24.
 Enamel, transparent, 11.
- FRENCH enamel, 13.
- GALVANISING, 39.
 Galvanising, difficulties in, 39.
 Galvanising, percentage of increase in weight, 42.
 Gilded articles, cleansing of, 44.
 Glass enamel for iron, 23.
 Graphite, 33.
 Green for polished brass, 44, 45.
 Green chrome, 31.
 Green, japan, 16.
 Grinding of paints, 32.
 Grounds for japanning, 17.
 Gold decoration, applying, 21.
 Golden varnish for metal, 46.
- HARDENING a zinc surface, 43.
 Herin's process, solution for, 39.
 Hydrated sesquioxide, 32.
- ILLUSTRATIONS of stove, 26, 27.
 Illustrations of japanner's stove, 26.
 Immersion process, 37.
 Immersion process, solutions for, 37, 38.
 Increase of weight due to hot galvanising, 42.
 Iron articles, enamelling of, 30.
 Iron, blacking for, 33.
 Iron, lacquer, black, for, 34.
 Iron and steel, varnish for, 36.
 Ironwork, cheap black paint or varnishes for, 34, 35.
- Ironwork, varnishes for, 35, 36.
- JAPANNER's stove, 26.
 Japanese varnish, 47.
 Japanning metals, 16.
 Japanning, origin of, 12.
- KITCHEN utensils, enamelling, 23.
- LACQUER black for iron and steel, 34.
 Lampblack, 33.
 Lead, testing enamels for, 16.
 Lead, white, 30.
 Light-coloured enamels, 19.
 Limonate, 32.
- MANGANESE, 32.
 Merits of dry or molten method of metallic surfaces, paints and varnishes for, 30.
 Metal polishes, 43.
 Mixing black enamels, 15.
 Mud-guards, japanning, 20,
- OLD work, enamelling, 21.
 Orange japan, 16.
 Ovens, brick, 28.
 Oxide pigments, objection to, 32.
 Oxides of iron, 32.
- PAINTING on zinc, 46.
 Paints, grinding of, 32.
 Paints and varnishes for metallic surfaces, 30.
 Pigment, objects of using, 30.
 Pigments used for preservative paints, 30.
 Polishes on metallic surfaces, 43.
 Polishing pomades, 44.
 Polishing powders, 44.
 Polishing water, 44.
 Polishing work, 17, 19.
 Pomades for polishing metal, 44.
 Potash lye, 22.
 Powders for polishing, 44.

- Preservative paints, pigments used for, 30.
Prevention of paint peeling off from a zinc surface, 40.
Processes for tin-plating, 36.
Purple japan, 16.
Prussian blue, 31.
Puscher's black enamel, 13.
- RECIPES for polishing soaps, 44.
Red japan, 15.
Red pigments, 31.
Red, Venetian, 32.
Reds, violets, and blues, tints for brass, 45.
Repairing, black varnish for, 36.
Rust on pipes, prevention of, by tarring, 36.
- SESQUIOXIDE, 32.
Sesquioxide, hydrated, 32.
Shellac varnish groundwork, 15.
Silicates, 32.
Silverware, cleansing of, 44.
Soaps for polishing metal, 44.
Solder-work, 22.
Solutions for immersion process, 37, 38.
Stove-blackening iron goods, 14.
Stove construction, 26.
Steel and iron, varnish for, 36.
Stoves for enamelling, 24.
- TARRING pipes to prevent rust, 36.
Tea-tray japanning, 20.
- Testing enamels for lead, 16.
Thermometer in stove, 26.
Tin articles, enamelling of, 30.
Tin, coating with, 37.
Tin goods, japanning, 20.
Tin-plating, processes for, 36.
Transfers, applying, 21.
Transparent enamel, 11.
- VARNISH for carriages, 46.
Varnish for iron and steel, 36.
Varnishes and paints for metallic surfaces, 30.
Varnishes for ironwork, 35, 36.
Venetian red, 32.
Violets, reds, and blues, for brass, 45.
- WATER for polishing, 44.
Weigler's process, 38.
White enamel for cast-iron, 22.
White enamel, mixing, 15.
White lead, use of, 30.
White zinc, use of, 31.
- YELLOW, chrome, 31.
Yellow, enamel, mixing, 15.
Yellow tints for brass, 45.
- ZINC, coating to prevent paint peeling off, 40.
Zinc, painting on, 46.
Zinc surfaces, characteristics of, 40, 41.
Zinc surface, hardening, 43.
Zinc, white, 31.

Catalogue

OF

Special Technical Works

FOR

MANUFACTURERS, STUDENTS, AND TECHNICAL SCHOOLS

BY EXPERT WRITERS

INDEX TO SUBJECTS.

PAGE	PAGE	PAGE
Agricultural Chemistry ... 10	Dyers' Materials ... 21	Petroleum ... 6
Air, Industrial Use of ... 11	Dye-stuffs ... 22	Pigments, Chemistry of ... 2
Alum and its Sulphates ... 9	Enamelling Metal ... 18	Plumbers' Work ... 27
Ammonia ... 9	Enamels ... 18	Porcelain Painting... 18
Aniline Colours ... 3	Engraving ... 31	Pottery Clays ... 16
Animal Fats ... 6	Essential Oils ... 7	Pottery Manufacture ... 14
Anti corrosive Paints ... 4	Evaporating Apparatus ... 26	Power-loom Weaving ... 19
Architecture, Terms in ... 30	External Plumbing... 27	Preserved Foods ... 30
Architectural Pottery ... 16	Fats ... 5, 6	Printers' Ready Reckoner 31
Artificial Perfumes... 7	Faults in Woollen Goods... 20	Printing Inks ... 3
Balsams ... 10	Gas Firing ... 26	Recipes for Oilmen, etc. . 3
Bibliography ... 32	Glass-making Recipes ... 17	Resins... 10
Bleaching ... 23	Glass Painting ... 17	Risks of Occupations ... 11
Bone Products ... 8	Glue Making and Testing... 8	Rivetting China, etc. ... 16
Bookbinding ... 31	Greases ... 5	Sanitary Plumbing ... 28
Brick-making ... 15, 16	History of Staffs Potteries 16	Scheele's Essays ... 9
Burnishing Brass ... 28	Hops ... 28	Sealing Waxes ... 11
Carpet Yarn Printing ... 21	Hot-water Supply ... 28	Silk Dyeing ... 22
Ceramic Books ... 14, 15	How to make a Woollen Mill	Silk Throwing ... 19
Charcoal ... 8	Pay ... 21	Smoke Prevention ... 26
Chemical Essays ... 9	India-rubber ... 13	Soaps ... 7
Chemistry of Pottery ... 17	Inks ... 3, 11	Spinning ... 20
Chemistry of Dye-stuffs ... 23	Iron-corrosion ... 4	Staining Marble, and Bone 31
Clay Analysis ... 16	Iron, Science of ... 26	Steam Drying ... 11
Coal-dust Firing ... 26	Japanning ... 28	Sugar Refining ... 32
Colour Matching ... 21	Lacquering ... 28	Steel Hardening ... 26
Colliery Recovery Work ... 25	Lake Pigments ... 2	Sweetmeats ... 30
Colour-mixing for Dyers ... 21	Lead and its Compounds... 11	Terra-cotta ... 16
Colour Theory ... 22	Leather Industry ... 13	Testing Paint Materials ... 4
Combing Machines... 24	Leather-working Materials 14	Testing Yarns ... 20
Compounding Oils ... 6	Lithography ... 31	Textile Fabrics ... 20
Condensing Apparatus ... 26	Lubricants ... 5, 6	Textile Materials ... 19, 20
Cosmetics ... 8	Manures ... 8, 10	Timber ... 29
Cotton Dyeing ... 23	Mineral Pigments ... 3	Varnishes ... 4
Cotton Spinning ... 24	Mine Ventilation ... 25	Vegetable Fats ... 7
Damask Weaving ... 20	Mine Haulage ... 25	Waste Utilisation ... 10
Dampness in Buildings ... 30	Oil and Colour Recipes ... 3	Water, Industrial Use ... 12
Decorators' Books... 28	Oil Boiling ... 4	Waterproofing Fabrics ... 21
Decorative Textiles ... 20	Oil Merchants' Manual ... 7	Weaving Calculations ... 20
Dental Metallurgy ... 25	Oils ... 5	Wood Waste Utilisation ... 29
Dictionary of Paint Materials 2	Ozone, Industrial Use of.. 12	Wood Dyeing ... 31
Drying Oils ... 5	Paint Manufacture... 2	Wool Dyeing ... 22, 23
Drying with Air ... 12	Paint Materials ... 3	Writing Inks ... 11
Dyeing Marble ... 31	Paint-material Testing ... 4	X-Ray Work ... 13
Dyeing Woollen Fabrics ... 23	Paper-pulp Dyeing... 18	Yarn Testing ... 20

PUBLISHED BY

SCOTT, GREENWOOD & CO.,

19 LUDGATE HILL, LONDON, E.C.

Tel. Address: "PRINTERIES, LONDON".

Tel. No. 5403, Bank.

Paints, Colours and Printing Inks.

THE CHEMISTRY OF PIGMENTS. By ERNEST J. PARRY, B.Sc. (Lond.), F.I.C., F.C.S., and J. H. COSTE, F.I.C., F.C.S. Demy 8vo. Five Illustrations. 285 pp. 1902. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

Introductory. Light—White Light—The Spectrum—The Invisible Spectrum—Normal Spectrum—Simple Nature of Pure Spectral Colour—The Recomposition of White Light—Primary and Complementary Colours—Coloured Bodies—Absorption Spectra—**The Application of Pigments.** Uses of Pigments: Artistic, Decorative, Protective—Methods of Application of Pigments: Pastels and Crayons, Water Colour, Tempera Painting, Fresco, Encaustic Painting, Oil-colour Painting, Ceramic Art, Enamel, Stained and Painted Glass, Mosaic—**Inorganic Pigments.** White Lead—Zinc White—Enamel White—Whitening—Red Lead—Litharge—Vermilion—Royal Scarlet—The Chromium Greens—Chromates of Lead, Zinc, Silver and Mercury—Brunswick Green—The Ochres—Indian Red—Venetian Red—Siennas and Umbers—Light Red—Cappagh Brown—Red Oxides—Mars Colours—Terre Verte—Prussian Brown—Cobalt Colours—Ceruleum—Smalt—Copper Pigments—Malachite—Bremen Green—Scheele's Green—Emerald Green—Verdigris—Brunswick Green—Non-arsenical Greens—Copper Blues—Ultramarine—Carbon Pigments—Ivory Black—Lamp Black—Bistre—Naples Yellow—Arsenic Sulphides: Orpiment, Realgar—Cadmium Yellow—Vandyck Brown—**Organic Pigments.** Prussian Blue—Natural Lakes—Cochineal—Carmine—Crimson—Lac Dye—Scarlet—Madder—Alizarin—Campeachy—Quercitron—Rhamnus—Brazil Wood—Alkanet—Santal Wood—Archil—Coal-tar Lakes—Red Lakes—Alizarin Compounds—Orange and Yellow Lakes—Green and Blue Lakes—Indigo—Dragon's Blood—Gamboge—Sepia—Indian Yellow, Puree—Bitumen. Asphaltum, Mummy—**Index.**

THE MANUFACTURE OF PAINT. A Practical Handbook for Paint Manufacturers, Merchants and Painters. By J. CRUICKSHANK SMITH, B.Sc. Demy 8vo. 1901. 200 pp. Sixty Illustrations and One Large Diagram. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Preparation of Raw Material—Storing of Raw Material—Testing and Valuation of Raw Material—Paint Plant and Machinery—The Grinding of White Lead—Grinding of White Zinc—Grinding of other White Pigments—Grinding of Oxide Paints—Grinding of Staining Colours—Grinding of Black Paints—Grinding of Chemical Colours—Yellows—Grinding of Chemical Colours—Blues—Grinding Greens—Grinding Reds—Grinding Lakes—Grinding Colours in Water—Grinding Colours in Turpentine—The Uses of Paint—Testing and Matching Paints—Economic Considerations—**Index.**

DICTIONARY OF CHEMICALS AND RAW PRODUCTS USED IN THE MANUFACTURE OF PAINTS, COLOURS, VARNISHES AND ALLIED PREPARATIONS. By GEORGE H. HURST, F.C.S. Demy 8vo. 380 pp. 1901. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

THE MANUFACTURE OF LAKE PIGMENTS FROM ARTIFICIAL COLOURS. By FRANCIS H. JENNISON, F.I.C., F.C.S. Sixteen Coloured Plates, showing Specimens of Eighty-nine Colours, specially prepared from the Recipes given in the Book. 136 pp. Demy 8vo. 1900. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

The Groups of the Artificial Colouring Matters—The Nature and Manipulation of Artificial Colours—Lake-forming Bodies for Acid Colours—Lake-forming Bodies' Basic Colours—Lake Bases—The Principles of Lake Formation—Red Lakes—Orange, Yellow, Green, Blue, Violet and Black Lakes—The Production of Insoluble Azo Colours in the Form of Pigments—The General Properties of Lakes Produced from Artificial Colours—Washing, Filtering and Finishing—Matching and Testing Lake Pigments—**Index.**

THE MANUFACTURE OF MINERAL AND LAKE PIGMENTS. Containing Directions for the Manufacture of all Artificial, Artists and Painters' Colours, Enamel, Soot and Metallic Pigments. A Text-book for Manufacturers, Merchants, Artists and Painters. By Dr. JOSEF BERSCH. Translated by A. C. WRIGHT, M.A. (Oxon.), B.Sc. (Lond.). Forty-three Illustrations. 476 pp., demy 8vo. 1901. Price 12s. 6d.; India and Colonies 13s. 6d.; Other Countries, 15s.; strictly net.

Contents.

Introduction—Physico-chemical Behaviour of Pigments—Raw Materials Employed in the Manufacture of Pigments—Assistant Materials—Metallic Compounds—The Manufacture of Mineral Pigments—The Manufacture of White Lead—Enamel White—Washing Apparatus—Zinc White—Yellow Mineral Pigments—Chrome Yellow—Lead Oxide Pigments—Other Yellow Pigments—Mosaic Gold—Red Mineral Pigments—The Manufacture of Vermilion—Antimony Vermilion—Ferric Oxide Pigments—Other Red Mineral Pigments—Purple of Cassius—Blue Mineral Pigments—Ultramarine—Manufacture of Ultramarine—Blue Copper Pigments—Blue Cobalt Pigments—Smalts—Green Mineral Pigments—Emerald Green—Verdigris—Chromium Oxide—Other Green Chromium Pigments—Green Cobalt Pigments—Green Manganese Pigments—Compounded Green Pigments—Violet Mineral Pigments—Brown Mineral Pigments—Brown Decomposition Products—Black Pigments—Manufacture of Soot Pigments—Manufacture of Lamp Black—The Manufacture of Soot Black without Chambers—Indian Ink—Enamel Colours—Metallic Pigments—Bronze Pigments—Vegetable Bronze Pigments.

PIGMENTS OF ORGANIC ORIGIN—Lakes—Yellow Lakes—Red Lakes—Manufacture of Carmine—The Colouring Matter of Lac—Safflower or Carthamine Red—Madder and its Colouring Matters—Madder Lakes—Manjit (Indian Madder)—Lichen Colouring Matters—Red Wood Lakes—The Colouring Matters of Sandal Wood and Other Dye Woods—Blue Lakes—Indigo Carmine—The Colouring Matter of Log Wood—Green Lakes—Brown Organic Pigments—Sap Colours—Water Colours—Crayons—Confectionery Colours—The Preparation of Pigments for Painting—The Examination of Pigments—Examination of Lakes—The Testing of Dye-Woods—The Design of a Colour Works—Commercial Names of Pigments—Appendix: Conversion of Metric to English Weights and Measures—Centigrade and Fahrenheit Thermometer Scales—Index.

RECIPES FOR THE COLOUR, PAINT, VARNISH, OIL, SOAP AND DRYSALTERY TRADES. Compiled by AN ANALYTICAL CHEMIST. 350 pp. 1902. Demy 8vo. Price 7s. 6d. India and British Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Pigments or Colours for Paints, Lithographic and Letterpress Printing Inks, etc.—Mixed Paints and Preparations for Paint-making, Painting, Lime-washing, Paperhanging, etc.—Varnishes for Coach-builders, Cabinetmakers, Wood-workers, Metal-workers, Photographers, etc.—Soaps for Toilet, Cleansing, Polishing, etc.—Perfumes—Lubricating Greases, Oils, etc.—Cements, Pastes, Glues and Other Adhesive Preparations—Writing, Marking, Endorsing and Other Inks—Sealing-wax and Office Requisites—Preparations for the Laundry, Kitchen, Stable and General Household Uses—Disinfectant Preparations—Miscellaneous Preparations—Index

OIL COLOURS AND PRINTING INKS. By LOUIS EDGAR ANDÉS. Translated from the German. 215 pp. Crown 8vo. 56 Illustrations. 1903. Price 5s.; India and British Colonies, 5s. 6d.; Other Countries, 6s.; strictly Net.

Contents.

Linseed Oil—Poppy Oil—Mechanical Purification of Linseed Oil—Chemical Purification of Linseed Oil—Bleaching Linseed Oil—Oxidizing Agents for Boiling Linseed Oil—Theory of Oil Boiling—Manufacture of Boiled Oil—Adulterations of Boiled Oil—Chinese Drying Oil and Other Specialities—Pigments for House and Artistic Painting and Inks—Pigment for Printers' Black Inks—Substitutes for Lampblack—Machinery for Colour Grinding and Rubbing—Machines for mixing Pigments with the Vehicle—Paint Mills—Manufacture of House Oil Paints—Ship Paints—Luminous Paint—Artists' Colours—Printers' Inks—VEHICLES—Printers' Inks—PIGMENTS and MANUFACTURE—Index.

(See also *Writing Inks*, p. 11.)

SIMPLE METHODS FOR TESTING PAINTERS' MATERIALS. By A. C. WRIGHT, M.A. (Oxon.), B.Sc. (Lond.). Crown 8vo. 160 pp. 1903. Price 5s.; India and British Colonies, 5s. 6d.; Other Countries, 6s.; strictly Nct.

Contents.

Necessity for Testing—Standards—Arrangement—The Apparatus—The Reagents—Practical Tests—Dry Colours—Stiff Paints—Liquid and Enamel Paints—Oil Varnishes—Spirit Varnishes—Driers—Putty—Linseed Oil—Turpentine—Water Stains—The Chemical Examination—Dry Colours and Paints—White Pigments and Paints—Yellow Pigments and Paints—Blue Pigments and Paints—Green Pigments and Paints—Red Pigments and Paints—Brown Pigments and Paints—Black Pigments and Paints—Oil Varnishes—Linseed Oil—Turpentine.

IRON-CORROSION, ANTI-FOULING AND ANTI-CORROSIVE PAINTS. Translated from the German of LOUIS EDGAR ANDÉS. Sixty-two Illustrations. 275 pp. Demy 8vo. 1900. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

Iron-rust and its Formation—Protection from Rusting by Paint—Grounding the Iron with Linseed Oil, etc.—Testing Paints—Use of Tar for Painting on Iron—Anti-corrosive Paints—Linseed Varnish—Chinese Wood Oil—Lead Pigments—Iron Pigments—Artificial Iron Oxides—Carbon—Preparation of Anti-corrosive Paints—Results of Examination of Several Anti-corrosive Paints—Paints for Ship's Bottoms—Anti-fouling Compositions—Various Anti-corrosive and Ship's Paints—Official Standard Specifications for Ironwork Paints—Index.

THE TESTING AND VALUATION OF RAW MATERIALS USED IN PAINT AND COLOUR MANUFACTURE. By M. W. JONES, F.C.S. A Book for the Laboratories of Colour Works. 88 pp. Crown 8vo. 1900. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

Aluminium Compounds—China Clay—Iron Compounds—Potassium Compounds—Sodium Compounds—Ammonium Hydrate—Acids—Chromium Compounds—Tin Compounds—Copper Compounds—Lead Compounds—Zinc Compounds—Manganese Compounds—Arsenic Compounds—Antimony Compounds—Calcium Compounds—Barium Compounds—Cadmium Compounds—Mercury Compounds—Ultramarine—Cobalt and Carbon Compounds—Oils—Index.

STUDENTS' MANUAL OF PAINTS, COLOURS, OILS AND VARNISHES. By JOHN FURNELL. Crown 8vo. 12 Illustrations. 96 pp. 1903. Price 2s. 6d.; Abroad, 3s.; strictly nct.

Contents.

Plant—Chromes—Blues—Greens—Earth Colours—Blacks—Reds—Lakes—Whites—Painters' Oils—Turpentine—Oil Varnishes—Spirit Varnishes—Liquid Paints—Enamel Paints.

Varnishes and Drying Oils.

THE MANUFACTURE OF VARNISHES, OIL REFINING AND BOILING, AND KINDRED INDUSTRIES. Translated from the French of ACH. LIVACHE, Ingénieur Civil des Mines. Greatly Extended and Adapted to English Practice, with numerous Original Recipes by JOHN GEDDES MCINTOSH. 27 Illustrations. 400 pp. Demy 8vo. 1899. Price 12s. 6d.; India and Colonies, 13s. 6d.; Other Countries, 15s.; strictly nct.

Contents.

Resins—Solvents: Natural, Artificial, Manufacture, Storage, Special Use—Colouring: Principles, Vegetable, Coal Tar, Coloured Resinates, Coloured Oleates and Linoleates—Gum Running: Melting Pots, Mixing Pans—Spirit Varnish Manufacture: Cold Solution Plant, Mechanical Agitators, Storage Plant—Manufacture, Characteristics and Uses of the Spirit Varnishes—Manufacture of Varnish Stains—Manufacture of Lacquers—Manufacture of Spirit Enamels—Analysis of Spirit Varnishes—Physical and Chemical Constants of Resins—Table of Solubility of Resins in different Menstrua—Systematic qualitative Analysis of Resins, Hirschop's tables—Drying Oils—Oil Refining: Processes—Oil Boiling—Driers—Liquid Driers—Solidified Boiled Oil—Manufacture of Linoleum—Manufacture of India Rubber Substitutes—Printing Ink Manufacture—Lithographic Ink Manufacture—Manufacture of Oil Varnishes—Running and Special Treatment of Amber, Copal, Kauri, Manilla—Addition of Oil to Resin—Addition of Resin to Oil—Mixed Processes—Solution in Cold of previously Fused Resin—Dissolving Resins in Oil, etc., under pressure—Filtration—Clarification—Storage—Ageing—Coachmakers' Varnishes and Japans—Oak Varnishes—Japanners' Stoving Varnishes—Japanners' Gold Size—Brunswick Black—Various Oil Varnishes—Oil-Varnish Stains—Varnishes for "Enamels"—India Rubber Varnishes—Varnishes Analysis: Processes, Matching—Faults in Varnishes: Cause, Prevention—Experiments and Exercises.

DRYING OILS, BOILED OIL AND SOLID AND LIQUID DRIERS. By L. E. ANDÉS. Expressly Written for this Series of Special Technical Books, and the Publishers hold the Copyright for English and Foreign Editions. Forty-two Illustrations. 342 pp. 1901. Demy 8vo. Price 12s. 6d.; India and Colonies, 13s. 6d.; Other Countries, 15s.; strictly net.

Contents.

Properties of the Drying Oils; Cause of the Drying Property; Absorption of Oxygen; Behaviour towards Metallic Oxides, etc.—The Properties of and Methods for obtaining the Drying Oils—Production of the Drying Oils by Expression and Extraction; Refining and Bleaching; Oil Cakes and Meal; The Refining and Bleaching of the Drying Oils; The Bleaching of Linseed Oil—The Manufacture of Boiled Oil; The Preparation of Drying Oils for Use in the Grinding of Paints and Artists' Colours and in the Manufacture of Varnishes by Heating over a Fire or by Steam, by the Cold Process, by the Action of Air, and by Means of the Electric Current; The Driers used in Boiling Linseed Oil; The Manufacture of Boiled Oil and the Apparatus therefor—Livache's Process for Preparing a Good Drying Oil and its Practical Application—The Preparation of Varnishes for Letterpress, Lithographic and Copperplate Printing, for Oilcloth and Waterproof Fabrics; The Manufacture of Thickened Linseed Oil, Burnt Oil, Stand Oil by Fire Heat, Superheated Steam, and by a Current of Air—Behaviour of the Drying Oils and Boiled Oils towards Atmospheric Influences, Water, Acids and Alkalies—Boiled Oil Substitutes—The Manufacture of Solid and Liquid Driers from Linseed Oil and Rosin; Linolic Acid Compounds of the Driers—The Adulteration and Examination of the Drying Oils and Boiled Oil.

Oils, Fats, Soaps and Perfumes.

LUBRICATING OILS, FATS AND GREASES: Their Origin, Preparation, Properties, Uses and Analyses. A Handbook for Oil Manufacturers, Refiners and Merchants, and the Oil and Fat Industry in General. By GEORGE H. HURST, F.C.S. Second Revised and Enlarged Edition. Sixty-five Illustrations. 317 pp. Demy 8vo. 1902. Price 10s. 6d.; India and Colonies, 11s.; Other Countries. 12s. strictly net.

Contents.

Introductory—Hydrocarbon Oils—Scotch Shale Oils—Petroleum—Vegetable and Animal Oils—Testing and Adulteration of Oils—Lubricating Greases—Lubrication—Appendices—Index.

TECHNOLOGY OF PETROLEUM: Oil Fields of the World—Their History, Geography and Geology—Annual Production and Development—Oil-well Drilling—Transport. By HENRY NEUBERGER and HENRY NOALHAT. Translated from the French by J. G. MCINTOSH. 550 pp. 153 Illustrations. 26 Plates. Super Royal 8vo. 1901. Price 21s.; India and Colonies, 22s.; Other Countries, 23s. 6d.; strictly net.

Contents.

Study of the Petroliferous Strata—Petroleum—Definition—The Genesis or Origin of Petroleum—The Oil Fields of Galicia, their History—Physical Geography and Geology of the Galician Oil Fields—Practical Notes on Galician Land Law—Economic Hints on Working, etc.—Roumania—History, Geography, Geology—Petroleum in Russia—History—Russian Petroleum (*continued*)—Geography and Geology of the Caucasian Oil Fields—Russian Petroleum (*continued*)—The Secondary Oil Fields of Europe, Northern Germany, Alsace, Italy, etc.—Petroleum in France—Petroleum in Asia—Transcaspian and Turkestan Territory—Turkestan—Persia—British India and Burmah—British Burmah or Lower Burmah—China—Chinese Thibet—Japan, Formosa and Saghalien—Petroleum in Oceania—Sumatra, Java, Borneo—Isle of Timor—Philippine Isles—New Zealand—The United States of America—History—Physical Geology and Geography of the United States Oil Fields—Canadian and other North American Oil Fields—Economic Data of Work in North America—Petroleum in the West Indies and South America—Petroleum in the French Colonies.

Excavations—Hand Excavation or Hand Digging of Oil Wells.

Methods of Boring.

Accidents—Boring Accidents—Methods of preventing them—Methods of remedying them—Explosives and the use of the "Torpedo" Levigation—Storing and Transport of Petroleum—General Advice—Prospecting, Management and carrying on of Petroleum Boring Operations.

General Data—Customary Formulæ—Memento. Practical Part. General Data bearing on Petroleum—Glossary of Technical Terms used in the Petroleum Industry—Copious Index.

THE PRACTICAL COMPOUNDING OF OILS, TALLOW AND GREASE FOR LUBRICATION, ETC.

By AN EXPERT OIL REFINER. 100 pp. 1898. Demy 8vo. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Introductory Remarks on the General Nomenclature of Oils, Tallow and Greases suitable for Lubrication—Hydrocarbon Oils—Animal and Fish Oils—Compound Oils—Vegetable Oils—Lamp Oils—Engine Tallow, Solidified Oils and Petroleum Jelly—Machinery Greases: Loco and Anti-friction—Clarifying and Utilisation of Waste Fats, Oils, Tank Bottoms, Drainings of Barrels and Drums, Pickings Up, Dregs, etc.—The Fixing and Cleaning of Oil Tanks, etc.—Appendix and General Information.

ANIMAL FATS AND OILS: Their Practical Production, Purification and Uses for a great Variety of Purposes. Their Properties, Falsification and Examination. Translated from the German of LOUIS EDGAR ANDÉS. Sixty-two Illustrations. 240 pp. Second Edition, Revised and Enlarged. 1904. Demy 8vo. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

Introduction—Occurrence, Origin, Properties and Chemical Constitution of Animal Fats—Preparation of Animal Fats and Oils—Machinery—Tallow-melting Plant—Extraction Plant—Presses—Filtering Apparatus—Butter: Raw Material and Preparation, Properties, Adulterations, Beef Lard or Remelted Butter: Testing—Candle-fish Oil—Mutton-Tallow—Hare Fat—Goose Fat—Neatsfoot Oil—Bone Fat: Bone Boiling, Steaming Bones, Extraction, Refining—Bone Oil—Artificial Butter: Olcomargarine, Margarine Manufacture in France, Grasso's Process, "Kaiser's Butter," Jahr & Münzberg's Method, Filbert's Process, Winter's Method—Human Fat—Horse Fat—Beef Marrow—Turtle Oil—Hog's Lard: Raw Material—Preparation, Properties, Adulterations, Examination—Lard Oil—Fish Oils—Liver Oils—Artificial Train Oil—Wool Fat: Properties, Purified Wool Fat—Spermaceti: Examination of Fats and Oils in General.

THE OIL MERCHANTS' MANUAL AND OIL TRADE READY RECKONER.

Compiled by FRANK F. SHERRIFF.
Second Edition Revised and Enlarged. Demy 8vo. 214 pp. 1904.
With Two Sheets of Tables. Price 7s. 6d.; India and Colonies, 8s.;
Other Countries, 8s. 6d.; strictly net.

Contents.

Trade Terms and Customs—Tables to Ascertain Value of Oil sold per cwt. or ton—Specific Gravity Tables—Percentage Tare Tables—Petroleum Tables—Paraffine and Benzoline Calculations—Customary Drafts—Tables for Calculating Allowance for Dirt, Water, etc.—Capacity of Circular Tanks Tables, etc., etc.

THE CHEMISTRY OF ESSENTIAL OILS AND ARTIFICIAL PERFUMES.

By ERNEST J. PARRY, B.Sc.
(Lond.), F.I.C., F.C.S. 411 pp. 20 Illustrations. 1899. Demy 8vo.
Price 12s. 6d.; India and Colonies, 13s. 6d.; Other Countries, 15s.;
strictly net.

Contents.

The General Properties of Essential Oils—Compounds occurring in Essential Oils—The Preparation of Essential Oils—The Analysis of Essential Oils—Systematic Study of the Essential Oils—Terpeneless Oils—The Chemistry of Artificial Perfumes—Appendix: Table of Constants—Index.

VEGETABLE FATS AND OILS: Their Practical Preparation, Purification and Employment for Various Purposes, their Properties, Adulteration and Examination.

Translated from the German of LOUIS EDGAR ANDÉS. Ninety-four Illustrations. 340 pp. Second Edition. 1902. Demy 8vo. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

General Properties—Estimation of the Amount of Oil in Seeds—The Preparation of Vegetable Fats and Oils—Apparatus for Grinding Oil Seeds and Fruits—Installation of Oil and Fat Works—Extraction Method of Obtaining Oils and Fats—Oil Extraction Installations—Press Moulds—Non-drying Vegetable Oils—Vegetable drying Oils—Solid Vegetable Fats—Fruits Yielding Oils and Fats—Wool-softening Oils—Soluble Oils—Treatment of the Oil after Leaving the Press—Improved Methods of Refining—Bleaching Fats and Oils—Practical Experiments on the Treatment of Oils with regard to Refining and Bleaching—Testing Oils and Fats.

SOAPS. A Practical Manual of the Manufacture of Domestic, Toilet and other Soaps.

By GEORGE H. HURST, F.C.S. 390 pp.
66 Illustrations. 1898. Price 12s. 6d.; India and Colonies, 13s. 6d.;
Other Countries, 15s.; strictly net.

Contents.

Introductory—Soap-maker's Alkalies—Soap Fats and Oils—Perfumes—Water as a Soap Material—Soap Machinery—Technology of Soap-making—Glycerine in Soap Lyes—Laying out a Soap Factory—Soap Analysis—Appendices.

Textile Soaps.

TEXTILE SOAPS AND OILS. Handbook on the Preparation, Properties and Analysis of the Soaps and Oils used in Textile Manufacturing, Dyeing and Printing.

By GEORGE H. HURST, F.C.S. Crown 8vo. 195 pp. 1904. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

Methods of Making Soaps—Hard Soap—Soft Soap. Special Textile Soaps—Wool Soaps—Calico Printers' Soaps—Dyers' Soaps. Relation of Soap to Water for Industrial Purposes—Treating Waste Soap Liquors—Boiled Off Liquor—Calico Printers and Dyers' Soap Liquors—Soap Analysis—Fat in Soap.

ANIMAL AND VEGETABLE OILS AND FATS—Tallow—Lard—Bone Grease—Tallow Oil. Vegetable Soap, Oils and Fats—Palm Oil—Coco-nut Oil—Olive Oil—Cotton seed Oil—Linseed Oil—Castor Oil—Corn Oil—Whale Oil or Train Oil—Repe Oil.

GLYCERINE.

TEXTILE OILS—Oleic Acid—Blended Wool Oils—Oils for Cotton Dyeing, Printing and Finishing—Turkey Red Oil—Alizarine Oil—Oleine—Oxy Turkey Red Oils—Soluble Oil—Analysis of Turkey Red Oil—Finisher's Soluble Oil—Finisher's Soap Softening—Testing and Adulteration of Oils—Index.

Cosmetical Preparations.

COSMETICS: MANUFACTURE, EMPLOYMENT AND TESTING OF ALL COSMETIC MATERIALS AND COSMETIC SPECIALITIES. Translated from the German of Dr. THEODOR KOLLER. Crown 8vo. 262 pp. 1902. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s. net.

Contents.

Purposes and Uses of, and Ingredients used in the Preparation of Cosmetics—Preparation of Perfumes by Pressure, Distillation, Maceration, Absorption or Enflourage, and Extraction Methods—Chemical and Animal Products used in the Preparation of Cosmetics—Oils and Fats used in the Preparation of Cosmetics—General Cosmetic Preparations—Mouth Washes and Tooth Pastes—Hair Dyes, Hair Restorers and Depilatories—Cosmetic Adjuncts and Specialities—Colouring Cosmetic Preparations—Antiseptic Washes and Soaps—Toilet and Hygienic Soaps—Secret Preparations for Skin, Complexion, Teeth, Mouth, etc.—Testing and Examining the Materials Employed in the Manufacture of Cosmetics—Index.

Glue, Bone Products and Manures.

GLUE AND GLUE TESTING. By SAMUEL RIDEAL, D.Sc. (Lond.), F.I.C. Fourteen Engravings. 144 pp. Demy 8vo. 1900. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

Constitution and Properties: Definitions and Sources, Gelatine, Chondrin and Allied Bodies, Physical and Chemical Properties, Classification, Grades and Commercial Varieties—**Raw Materials and Manufacture:** Glue Stock, Lining, Extraction, Washing and Clarifying, Filter Presses, Water Supply, Use of Alkalies, Action of Bacteria and of Antiseptics, Various Processes, Cleansing, Forming, Drying, Crushing, etc., Secondary Products—**Uses of Glue:** Selection and Preparation for Use, Carpentry, Veneering, Paper-Making, Book-binding, Printing Rollers, Hectographs, Match Manufacture, Sandpaper, etc., Substitutes for other Materials, Artificial Leather and Caoutchouc—**Gelatine:** General Characters, Liquid Gelatine, Photographic Uses, Size, Tanno, Chrome and Formo-Gelatine, Artificial Silk, Cements, Pneumatic Tyres, Culinary, Meat Extracts, Isinglass, Medicinal and other Uses, Bacteriology—**Glue Testing:** Review of Processes, Chemical Examination, Adulteration, Physical Tests, Valuation of Raw Materials—**Commercial Aspects.**

BONE PRODUCTS AND MANURES: An Account of the most recent Improvements in the Manufacture of Fat, Glue, Animal Charcoal, Size, Gelatine and Manures. By THOMAS LAMBERT, Technical and Consulting Chemist. Illustrated by Twenty-one Plans and Diagrams. 162 pp. Demy 8vo. 1901. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Chemical Composition of Bones—Arrangement of Factory—Properties of Glue—Glutin and Chondrin—Skin Glue—Liming of Skins—Washing—Boiling of Skins—Clarification of Glue Liquors—Glue-Boiling and Clarifying—House—Specification of a Glue—Size—Uses and Preparation and Composition of Size—Concentrated Size—Properties of Gelatine—Preparation of Skin Gelatine—Drying—Bone Gelatine—Selecting Bones—Crushing—Dissolving—Bleaching—Boiling—Properties of Glutin and Chondrin—Testing of Glues and Gelatines—The Uses of Glue, Gelatine and Size in Various Trades—Soluble and Liquid Glues—Steam and Waterproof Glues—**Manures**—Importation of Food Stuffs—Soils—Germination—Plant Life—**Natural Manures**—Water and Nitrogen in Farmyard Manure—Full Analysis of Farmyard Manure—Action on Crops—Water-Closet System—Sewage Manure—Green Manures—**Artificial Manures**—**Mineral Manures**—Nitrogenous Matters—Shoddy—Hoofs and Horns—Leather Waste—Dried Meat—Dried Blood—Superphosphates—Composition—Manufacture—Common Raw Bones—Degreased Bones—Crude Fat—Refined Fat—Degelatinised Bones—Animal Charcoal—Bone Superphosphates—Guanos—Dried Animal Products—Potash Compounds—Sulphate of Ammonia—Extraction in Vacuo—French and British Gelatines compared—Index.

Chemicals, Waste Products and Agricultural Chemistry.

REISSUE OF CHEMICAL ESSAYS OF C. W. SCHEELE. First Published in English in 1786. Translated from the Academy of Sciences at Stockholm, with Additions. 300 pp. Demy 8vo. 1901. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

Memoir: C. W. Scheele and his work (written for this edition by J. G. McIntosh)—On Fluor Mineral and its Acid—On Fluor Mineral—Chemical Investigation of Fluor Acid, with a View to the Earth which it Yields, by Mr. Wiegler—Additional Information Concerning Fluor Minerals—On Manganese, Magnesium, or Magnesia Vitriariorum—On Arsenic and its Acid—Remarks upon Salts of Benzoïn—On Silex, Clay and Alum—Analysis of the Calculus Vesical—Method of Preparing Mercurius Dulcis Via Humida—Cheaper and more Convenient Method of Preparing Pulvis Algarothi—Experiments upon Molybdæna—Experiments on Plumbago—Method of Preparing a New Green Colour—Of the Decomposition of Neutral Salts by Unslaked Lime and Iron—On the Quantity of Pure Air which is Daily Present in our Atmosphere—On Milk and its Acid—On the Acid of Saccharum Lactis—On the Constituent Parts of Lapis Ponderosus or Tungsten—Experiments and Observations on Ether—Index.

THE MANUFACTURE OF ALUM AND THE SULPHATES AND OTHER SALTS OF ALUMINA AND IRON. Their Uses and Applications as Mordants in Dyeing and Calico Printing, and their other Applications in the Arts, Manufactures, Sanitary Engineering, Agriculture and Horticulture. Translated from the French of LUCIEN GESCHWIND. 195 Illustrations. 400 pp. Royal 8vo. 1901. Price 12s. 6d.; India and Colonies, 13s. 6d.; Other Countries, 15s.; strictly net.

Contents.

Theoretical Study of Aluminium, Iron, and Compounds of these Metals—Aluminium and its Compounds—Iron and Iron Compounds.

Manufacture of Aluminium Sulphates and Sulphates of Iron—Manufacture of Aluminium Sulphate and the Alums—Manufacture of Sulphates of Iron.

Uses of the Sulphates of Aluminium and Iron—Uses of Aluminium Sulphate and Alums—Application to Wool and Silk—Preparing and using Aluminium Acetates—Employment of Aluminium Sulphate in Carbonising Wool—The Manufacture of Lake Pigments—Manufacture of Prussian Blue—Hide and Leather Industry—Paper Making—Hardening Plaster—Lime Washes—Preparation of Non-inflammable Wood, etc.—Purification of Waste Waters—Uses and Applications of Ferrous Sulphate and Ferric Sulphates—Dyeing—Manufacture of Pigments—Writing Inks—Purification of Lighting Gas—Agriculture—Cotton Dyeing—Disinfectant—Purifying Waste Liquors—Manufacture of Nordhausen Sulphuric Acid—Fertilising.

Chemical Characteristics of Iron and Aluminium—Analysis of Various Aluminous or Ferruginous Products—Aluminium—Analysing Aluminium Products—Aluminate Alumina—Sodium Aluminate—Aluminium Sulphate—Iron—Analytical Characteristics of Iron Salts—Analysis of Pyritic Lignite—Ferrous and Ferric Sulphates—Rouil Mordant—Index.

AMMONIA AND ITS COMPOUNDS: Their Manufacture and Uses. By CAMILLE VINCENT, Professor at the Central School of Arts and Manufactures, Paris. Translated from the French by M. J. SALTER. Royal 8vo. 114 pp. 1901. Thirty-two Illustrations. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

General Considerations: Various Sources of Ammoniacal Products; Human Urine as a Source of Ammonia—Extraction of Ammoniacal Products from Sewage—Extraction of Ammonia from Gas Liquor—Manufacture of Ammoniacal Compounds from Bones, Nitrogenous Waste, Beetroot Wash and Peat—Manufacture of Caustic Ammonia, and Ammonium Chloride, Phosphate and Carbonate—Recovery of Ammonia from the Ammonia-Soda Mother Liquors—Index.

ANALYSIS OF RESINS AND BALSAMS. Translated from the German of Dr. KARL DIETERICH. Demy 8vo. 340 pp. 1901. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Definition of Resins in General—Definition of Balsams, and especially the Gum Resins—External and Superficial Characteristics of Resinous Bodies—Distinction between Resinous Bodies and Fats and Oils—Origin, Occurrence and Collection of Resinous Substances—Classification—Chemical Constituents of Resinous Substances—Resinols—Resinot Annols—Behaviour of Resin Constituents towards the Cholesterine Reactions—Uses and Identification of Resins—Melting-point—Solvents—Acid Value—Saponification Value—Resin Value—Ester and Ether Values—Acetyl and Carbonyl Value—Methyl Value—Resin Acid—Systematic Résumé of the Performance of the Acid and Saponification Value Tests.

Balsams—Introduction—Definitions—Canada Balsam—Copaiba Balsam—Angostura Copaiba Balsam—Babia Copaiba Balsam—Carthagena Copaiba Balsam—Maracaibo Copaiba Balsam—Maturin Copaiba Balsam—Gurjum Copaiba Balsam—Para Copaiba Balsam—Surinam Copaiba Balsam—West African Copaiba Balsam—Mecca Balsam—Peruvian Balsam—Tolu Balsam—Acaroid Resin—Amine—Amber—African and West Indian Kino—Bengal Kino—Labdanum—Mastic—Pine Resin—Sandarach—Scammonium—Shellac—Storax—Adulteration of Styrax Liquidus Crudus—Purified Storax—Styrax Crudus Colatus—Tacamahac—Thapsia Resin—Turpentine—Chios Turpentine—Strassburg Turpentine—Turpeth Turpentine. **Gum Resins**—Ammoniacum—Bdellium—Euphorbium—Galbanum—Gamboge—Lactucarium—Myrrh—Opopanax—Sagapenum—Olibanum or Incense—Acaroid Resin—Amber—Thapsia Resin—Index.

MANUAL OF AGRICULTURAL CHEMISTRY. By HERBERT INGLE, F.I.C., Lecturer on Agricultural Chemistry, the Yorkshire College; Lecturer in the Victoria University. 388 pp. 11 Illustrations. 1902. Demy 8vo. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d. net.

Contents.

Introduction—The Atmosphere—The Soil—The Reactions occurring in Soils—The Analysis of Soils—Manures, Natural—Manures (continued)—The Analysis of Manures—The Constituents of Plants—The Plant—Crops—The Animal—Foods and Feeding—Milk and Milk Products—The Analysis of Milk and Milk Products—Miscellaneous Products used in Agriculture—Appendix—Index.

THE UTILISATION OF WASTE PRODUCTS. A Treatise on the Rational Utilisation, Recovery and Treatment of Waste Products of all kinds. By Dr. THEODOR KOLLER. Translated from the Second Revised German Edition. Twenty-two Illustrations. Demy 8vo. 280 pp. 1902. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

The Waste of Towns—**Ammonia and Sal-Ammoniac**—Rational Processes for Obtaining these Substances by Treating Residues and Waste—Residues in the Manufacture of Aniline Dyes—Amber Waste—Brewers' Waste—Blood and Slaughter-House Refuse—Manufactured Fuels—Waste Paper and Bookbinders' Waste—Iron Slags—Excrement—Colouring Matters from Waste—Dyers' Waste Waters—Fat from Waste—Fish Waste—Calamine Sludge—Tannery Waste—Gold and Silver Waste—India-rubber and Caoutchouc Waste—Residues in the Manufacture of Rosin Oil—Wood Waste—Horn Waste—Infusorial Earth—Iridium from Goldsmiths' Sweepings—Jute Waste—Cork Waste—Leather Waste—Glue Makers' Waste—Illuminating Gas from Waste and the By-Products of the Manufacture of Coal Gas—Meerschum—Molasses—Metal Waste—By-Products in the Manufacture of Mineral Waters—Fruit—The By-Products of Paper and Paper Pulp Works—By-Products in the Treatment of Coal Tar Oils—Fur Waste—The Waste Matter in the Manufacture of Parchment Paper—Mother of Pearl Waste—Petroleum Residues—Platinum Residues—Broken Porcelain. Earthenware and Glass—Salt Waste—Slate Waste—Sulphur—Burnt Pyrites—Silk Waste—Soap Makers' Waste—Alkali Waste and the Recovery of Soda—Waste Produced in Grinding Mirrors—Waste Products in the Manufacture of Starch—Stearic Acid—Vegetable Ivory Waste—Turf—Waste Waters of Cloth Factories—Wine Residues—Tinplate Waste—Wool Waste—Wool Sweat—The Waste Liquids from Sugar Works—Index.

Writing Inks and Sealing Waxes.

INK MANUFACTURE : Including Writing, Copying, Lithographic, Marking, Stamping, and Laundry Inks. By SIGMUND LEHNER. Three illustrations. Crown 8vo. 162 pp. 1902. Translated from the German of the Fifth Edition. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; net.

Contents.

Varieties of Ink—Writing Inks—Raw Materials of Tannin Inks—The Chemical Constitution of the Tannin Inks—Recipes for Tannin Inks—Logwood Tannin Inks—Ferric Inks—Alizarine Inks—Extract Inks—Logwood Inks—Copying Inks—Hektographs—Hektograph Inks—Safety Inks—Ink Extracts and Powders—Preserving Inks—Changes in Ink and the Restoration of Faded Writing—Coloured Inks—Red Inks—Blue Inks—Violet Inks—Yellow Inks—Green Inks—Metallic Inks—Indian Ink—Lithographic Inks and Pencils—Ink Pencils—Marking Inks—Ink Specialities—Sympathetic Inks—Stamping Inks—Laundry or Washing Blue—Index.

SEALING-WAXES, WAFERS AND OTHER ADHESIVES FOR THE HOUSEHOLD, OFFICE, WORKSHOP AND FACTORY. By H. C. STANDAGE. Crown 8vo. 96 pp. 1902. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

Materials Used for Making Sealing-Waxes—The Manufacture of Sealing-Waxes—Wafers—Notes on the Nature of the Materials Used in Making Adhesive Compounds—Cements for Use in the Household—Office Gums, Pastes and Mucilages—Adhesive Compounds for Factory and Workshop Use.

Lead Ores and Compounds.

LEAD AND ITS COMPOUNDS. By THOS. LAMBERT, Technical and Consulting Chemist. Demy 8vo. 226 pp. Forty illustrations. 1902. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; net. Plans and Diagrams.

Contents.

History—Ores of Lead—Geographical Distribution of the Lead Industry—Chemical and Physical Properties of Lead—Alloys of Lead—Compounds of Lead—Dressing of Lead Ores—Smelting of Lead Ores—Smelting in the Scotch or American Ore-hearth—Smelting in the Shaft or Blast Furnace—Condensation of Lead Fume—Desilverisation, or the Separation of Silver from Argentiferous Lead—Cupellation—The Manufacture of Lead Pipes and Sheets—Protoxide of Lead—Litharge and Massicot—Red Lead or Minium—Lead Poisoning—Lead Substitutes—Zinc and its Compounds—Pumice Stone—Drying Oils and Siccatives—Oil of Turpentine Resin—Classification of Mineral Pigments—Analysis of Raw and Finished Products—Tables—Index.

NOTES ON LEAD ORES : Their Distribution and Properties. By JAS. FAIRIE, F.G.S. Crown 8vo. 1901. 64 pages. Price 2s. 6d.; Abroad, 3s.; strictly net.

Industrial Hygiene.

THE RISKS AND DANGERS TO HEALTH OF VARIOUS OCCUPATIONS AND THEIR PREVENTION. By LEONARD A. PARRY, M.D., B.Sc. (Lond.). 196 pp. Demy 8vo. 1900. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Occupations which are Accompanied by the Generation and Scattering of Abnormal Quantities of Dust—Trades in which there is Danger of Metallic Poisoning—Certain Chemical Trades—Some Miscellaneous Occupations—Trades in which Various Poisonous Vapours are Inhaled—General Hygienic Considerations—Index.

Industrial Uses of Air, Steam and Water.

DRYING BY MEANS OF AIR AND STEAM. Explanations, Formulæ, and Tables for Use in Practice. Translated from the German of E. HAUSBRAND. Two folding Diagrams and Thirteen Tables. Crown 8vo. 1901. 72 pp. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

British and Metric Systems Compared—Centigrade and Fahr. Thermometers—Estimation of the Maximum Weight of Saturated Aqueous Vapour which can be contained in 1 kilo. of Air at Different Pressure and Temperatures—Calculation of the Necessary Weight and Volume of Air, and of the Least Expenditure of Heat, per Drying Apparatus with Heated Air, at the Atmospheric Pressure: *A*, With the Assumption that the Air is *Completely Saturated* with Vapour both before Entry and after Exit from the Apparatus—*B*, When the Atmospheric Air is *Completely Saturated before entry*, but at its *exit* is only $\frac{2}{3}$, $\frac{1}{2}$ or $\frac{1}{3}$ Saturated—*C*, When the Atmospheric Air is *not* Saturated with Moisture before Entering the Drying Apparatus—Drying Apparatus, in which, in the Drying Chamber, a Pressure is Artificially Created, Higher or Lower than that of the Atmosphere—Drying by Means of Superheated Steam, without Air—Heating Surface, Velocity of the Air Current, Dimensions of the Drying Room, Surface of the Drying Material, Losses of Heat—Index.

(See also "*Evaporating, Condensing and Cooling Apparatus*," p. 27.)

PURE AIR, OZONE AND WATER. A Practical Treatise of their Utilisation and Value in Oil, Grease, Soap, Paint, Glue and other Industries. By W. B. COWELL. Twelve Illustrations. Crown 8vo. 85 pp. 1900. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

Atmospheric Air; Lifting of Liquids; Suction Process; Preparing Blown Oils; Preparing Siccative Drying Oils—Compressed Air; Whitewash—Liquid Air; Retrocession—Purification of Water; Water Hardness—Fleshings and Bones—Ozonised Air in the Bleaching and Deodorising of Fats, Glues, etc.; Bleaching Textile Fibres—Appendix: Air and Gases; Pressure of Air at Various Temperatures; Fuel; Table of Combustibles; Saving of Fuel by Heating Feed Water; Table of Solubilities of Scale Making Minerals; British Thermal Units Tables; Volume of the Flow of Steam into the Atmosphere; Temperature of Steam—Index.

THE INDUSTRIAL USES OF WATER. COMPOSITION—EFFECTS—TROUBLES—REMEDIES—RESIDUARY WATERS—PURIFICATION—ANALYSIS.

By H. DE LA COUX. Royal 8vo. Translated from the French and Revised by ARTHUR MORRIS. 364 pp. 135 Illustrations. 1903. Price 10s. 6d.; Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

Chemical Action of Water in Nature and in Industrial Use—Composition of Waters—Solubility of Certain Salts in Water Considered from the Industrial Point of View—Effects on the Boiling of Water—Effects of Water in the Industries—Difficulties with Water—Feed Water for Boilers—Water in Dyeworks, Print Works, and Bleach Works—Water in the Textile Industries and in Conditioning—Water in Soap Works—Water in Laundries and Washhouses—Water in Tanning—Water in Preparing Tannin and Dyewood Extracts—Water in Papermaking—Water in Photography—Water in Sugar Refining—Water in Making Ices and Beverages—Water in Cider Making—Water in Brewing—Water in Distilling—Preliminary Treatment and Apparatus—Substances Used for Preliminary Chemical Purification—Commercial Specialities and their Employment—Precipitation of Matters in Suspension in Water—Apparatus for the Preliminary Chemical Purification of Water—Industrial Filters—Industrial Sterilisation of Water—Residuary Waters and their Purification—Soil Filtration—Purification by Chemical Processes—Analyses—Index.

(See Books on *Smoke Prevention, Engineering and Metallurgy*, p. 26, etc.)

X Rays.

PRACTICAL X RAY WORK. By FRANK T. ADDYMAN, B.Sc. (Lond.), F.I.C., Member of the Roentgen Society of London; Radiographer to St. George's Hospital; Demonstrator of Physics and Chemistry, and Teacher of Radiography in St. George's Hospital Medical School. Demy 8vo. Twelve Plates from Photographs of X Ray Work. Fifty-two Illustrations. 200 pp. 1901. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

Historical—Work leading up to the Discovery of the X Rays—The Discovery—**Apparatus and its Management**—Electrical Terms—Sources of Electricity—Induction Coils—Electrostatic Machines—Tubes—Air Pumps—Tube Holders and Stereoscopic Apparatus—Fluorescent Screens—**Practical X Ray Work**—Installations—Radioscopy—Radiography—X Rays in Dentistry—X Rays in Chemistry—X Rays in War—Index.

List of Plates.

Frontispiece—Congenital Dislocation of Hip-Joint.—I., Needle in Finger.—II., Needle in Foot.—III., Revolver Bullet in Calf and Leg.—IV., A Method of Localisation.—V., Stellate Fracture of Patella showing shadow of "Strapping"—VI., Sarcoma.—VII., Six-weeks-old Injury to Elbow showing new Growth of Bone.—VIII., Old Fracture of Tibia and Fibula badly set.—IX., Heart Shadow.—X., Fractured Femur showing Grain of Splint.—XI., Barrell's Method of Localisation.

India-Rubber and Gutta Percha.

INDIA-RUBBER AND GUTTA PERCHA. Translated from the French of T. SEELIGMANN, G. LAMY TORVILHON and H. FALCONNET by JOHN GEDDES MCINTOSH. Royal 8vo. Eighty-six Illustrations. Three Plates. 412 pages. 1903. Price 12s. 6d.; India and Colonies, 13s. 6d.; Other Countries, 15s.; strictly net.

Contents.

India-Rubber—Botanical Origin—Climatology—Soil—Rational Culture and Acclimation of the Different Species of India-Rubber Plants—Methods of Obtaining the Latex—Methods of Preparing Raw or Crude India-Rubber—Classification of the Commercial Species of Raw Rubber—Physical and Chemical Properties of the Latex and of India-Rubber—Mechanical Transformation of Natural Caoutchouc into Washed or Normal Caoutchouc (Purification) and Normal Rubber into Masticated Rubber—Softening, Cutting, Washing, Drying—Preliminary Observations—Vulcanisation of Normal Rubber—Chemical and Physical Properties of Vulcanised Rubber—General Considerations—Hardened Rubber or Ebonite—Considerations on Mineralisation and other Mixtures—Coloration and Dyeing—Analysis of Natural or Normal Rubber and Vulcanised Rubber—Rubber Substitutes—Imitation Rubber.

Gutta Percha—Botanical Origin—Climatology—Soil—Rational Culture—Methods of Collection—Classification of the Different Species of Commercial Gutta Percha—Physical and Chemical Properties—Mechanical Transformation—Methods of Analysing—Gutta Percha Substitutes—Index.

Leather Trades.

PRACTICAL TREATISE ON THE LEATHER INDUSTRY. By A. M. VILLON. Translated by FRANK T. ADDYMAN, B.Sc. (Lond.), F.I.C., F.C.S.; and Corrected by an Eminent Member of the Trade. 500 pp., royal 8vo. 1901. 123 Illustrations. Price 21s.; India and Colonies, 22s.; Other Countries, 23s. 6d.; strictly net.

Contents.

Preface—Translator's Preface—List of Illustrations.

Part I., Materials used in Tanning—Skins: Skin and its Structure; Skins used in Tanning; Various Skins and their Uses—Tannin and Tanning Substances: Tannin; Barks (Oak); Barks other than Oak; Tanning Woods; Tannin-bearing Leaves; Excrecences; Tan-bearing Fruits; Tan-bearing Roots and Bulbs; Tanning Juices; Tanning Substances used in Various Countries; Tannin Extracts; Estimation of Tannin and Tannin Principles.

Part II., Tanning—The Installation of a Tannery; Tan Furnaces; Chimneys, Boilers, etc.; Steam Engines—Grinding and Trituration of Tanning Substances: Cutting up Bark; Grinding Bark; The Grinding of Tan Woods; Powdering Fruit, Galls and Grains; Notes on

the Grinding of Bark—Manufacture of Sole Leather: Soaking; Sweating and Unhairing; Plumping and Colouring; Handling; Tanning; Tanning Elephants' Hides; Drying; Striking or Pinning—Manufacture of Dressing Leather: Soaking; Depilation; New Processes for the Depilation of Skins; Tanning; Cow Hides; Horse Hides; Goat Skins; Manufacture of Split Hides—On Various Methods of Tanning: Mechanical Methods; Physical Methods; Chemical Methods; Tanning with Extracts—Quantity and Quality; Quantity; Net Cost; Quality of Leather—Various Manipulations of Tanned Leather: Second Tanning; Grease Stains; Bleaching Leather; Waterproofing Leather; Weighting Tanned Leather; Preservation of Leather—Tanning Various Skins.

Part III., **Currying**—Waxed Calf: Preparation; Shaving; Stretching or Slicking; Oiling the Grain; Oiling the Flesh Side; Whitening and Graining; Waxing; Finishing; Dry Finishing; Finishing in Colour; Cost—White Calf: Finishing in White—Cow Hide for Upper Leathers: Black Cow Hide; White Cow Hide; Coloured Cow Hide—Smooth Cow Hide—Black Leather—Miscellaneous Hides: Horse; Goat; Waxed Goat Skin; Matt Goat Skin—Russia Leather: Russia Leather; Artificial Russia Leather.

Part IV., **Enamelled, Hungary and Chamoy Leather, Morocco, Parchment, Furs and Artificial Leather**—Enamelled Leather: Varnish Manufacture; Application of the Enamel; Enamelling in Colour—Hungary Leather: Preliminary; Wet Work or Preparation; Aluming; Dressing or Loft Work; Tallowing; Hungary Leather from Various Hides—Tawing: Preparatory Operations; Dressing; Dyeing Tawed Skins; Rugs—Chamoy Leather—Morocco: Preliminary Operations, Morocco Tanning: Mordants used in Morocco Manufacture; Natural Colours used in Morocco Dyeing; Artificial Colours; Different Methods of Dyeing: Dyeing with Natural Colours; Dyeing with Aniline Colours; Dyeing with Metallic Salts; Leather Printing; Finishing Morocco; Shagreen; Bronzed Leather—Gilding and Silvering: Gilding; Silvering; Nickel and Cobalt—Parchment—Furs and Furriery: Preliminary Remarks; Indigenous Furs; Foreign Furs from Hot Countries; Foreign Furs from Cold Countries; Furs from Birds' Skins; Preparation of Furs; Dressing; Colouring; Preparation of Birds' Skins; Preservation of Furs—Artificial Leather: Leather made from Scraps; Compressed Leather; American Cloth; Papier Mâché; Linoleum; Artificial Leather.

Part V., **Leather Testing and the Theory of Tanning**—Testing and Analysis of Leather: Physical Testing of Tanned Leather; Chemical Analysis—The Theory of Tanning and the other Operations of the Leather and Skin Industry: Theory of Soaking; Theory of Unhairing; Theory of Swelling; Theory of Handling; Theory of Tanning; Theory of the Action of Tannin on the Skin; Theory of Hungary Leather Making; Theory of Tawing; Theory of Chamoy Leather Making; Theory of Mineral Tanning.

Part VI., **Uses of Leather**—Machine Belts: Manufacture of Belting; Leather Chain Belts; Various Belts, Use of Belts—Boot and Shoe-making: Boots and Shoes; Laces—Saddlery: Composition of a Saddle; Construction of a Saddle—Harness: The Pack Saddle; Harness—Military Equipment—Glove Making—Carriage Building—Mechanical Uses.

Appendix, **The World's Commerce in Leather**—Europe; America; Asia; Africa; Australasia—Index.

THE LEATHER WORKER'S MANUAL. Being a Compendium of Practical Recipes and Working Formulæ for Curriers, Bootmakers, Leather Dressers, Blacking Manufacturers, Saddlers, Fancy Leather Workers. By H. C. STANDAGE. 165 pp. 1900. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Blackings, Polishes, Glosses, Dressings, Renovators, etc., for Boot and Shoe Leather—Harness Blackings, Dressings, Greases, Compositions, Soaps, and Boot-top Powders and Liquids, etc., etc.—Leather Grinders' Sundries—Currier's Seasonings, Blacking Compounds, Dressings, Finishes, Glosses, etc.—Dyes and Stains for Leather—Miscellaneous Information—Chrome Tannage—Index.

Books on Pottery, Bricks, Tiles, Glass, etc.

THE MANUAL OF PRACTICAL POTTING. Compiled by Experts, and Edited by CHAS. F. BINNS. Revised Third Edition and Enlarged. 200 pp. 1901. Price 17s. 6d.; India and Colonies, 18s. 6d.; Other Countries, 20s.; strictly net.

Contents.

Introduction. The Rise and Progress of the Potter's Art—**Bodies.** China and Porcelain Bodies, Parian Bodies, Semi-porcelain and Vitreous Bodies, Mortar Bodies, Earthenwares Granite and C.C. Bodies, Miscellaneous Bodies, Sagger and Crucible Clays, Coloured Bodies, Jasper Bodies, Coloured Bodies for Mosaic Painting, Encaustic Tile Bodies, Body Stains, Coloured Dips—**Glazes.** China Glazes, Ironstone Glazes, Earthenware Glazes, Glazes without Lead, Miscellaneous Glazes, Coloured Glazes, Majolica Colours—**Gold and Gold Colours.** Gold, Purple of Cassius, Marone and Ruby, Enamel Coloured Bases, Enamel Colour Fluxes, Enamel Colours, Mixed Enamel Colours, Antique and Vellum Enamel Colours, Underglaze Colours, Underglaze Colour Fluxes, Mixed Underglaze Colours, Flow Powders, Oils and Varnishes—**Means and Methods.** Reclamation of Waste Gold, The Use of Cobalt, Notes on Enamel Colours, Liquid or Bright Gold—**Classification and Analysis.** Classification of Clay Ware, Lord Playfair's Analysis of Clays, The Markets of the World, Time and Scale of Firing, Weights of Potter's Material, Decorated Goods Count—Comparative Loss of Weight of Clays—Ground Felspar Calculations—The Conversion of Slop Body Recipes into Dry Weight—The Cost of Prepared Earthenware Clay—**Forms and Tables.** Articles of Apprenticeship, Manufacturer's Guide to Stocktaking, Table of Relative Values of Potter's Materials, Hourly Wages Table, Workman's Settling Table, Comparative Guide for Earthenware and China Manufacturers in the use of Slop Flint and Slop Stone, Foreign Terms applied to Earthenware and China Goods, Table for the Conversion of Metrical Weights and Measures on the Continent and South America—**Index.**

CERAMIC TECHNOLOGY: Being some Aspects of Technical Science as Applied to Pottery Manufacture. Edited by CHARLES F. BINNS. 100 pp. Demy 8vo. 1897. Price 12s. 6d.; India and Colonies, 13s. 6d.; Other Countries, 15s.; strictly net.

Contents.

Preface—The Chemistry of Pottery—Analysis and Synthesis—Clays and their Components—The Biscuit Oven—Pyrometry—Glazes and their Composition—Colours and Colour-making—Index.

A TREATISE ON THE CERAMIC INDUSTRIES. A Complete Manual for Pottery, Tile and Brick Works. By EMILE BOURRY. Translated from the French by WILTON P. RIX, Examiner in Pottery and Porcelain to the City and Guilds of London Technical Institute, Pottery Instructor to the Hanley School Board. Royal 8vo. 1901. 760 pp. 323 Illustrations. Price 21s.; India and Colonies, 22s.; Other Countries, 23s. 6d.; strictly net.

Contents.

Part I., General Pottery Methods. Definition and History. Definitions and Classification of Ceramic Products—Historic Summary of the Ceramic Art—Raw Materials of Bodies. Clays: Pure Clay and Natural Clays—Various Raw Materials: Analogous to Clay—Agglomerative and Agglutinative—Opening—Fusible—Refractory—Trials of Raw Materials—Plastic Bodies. Properties and Composition—Preparation of Raw Materials: Disaggregation—Purification—Preparation of Bodies: By Plastic Method—By Dry Method—By Liquid Method—Formation. Processes of Formation: Throwing—Expression—Moulding by Hand, on the Jolley, by Compression, by Slip Casting—Slapping—Slipping—Drying. Drying of Bodies—Processes of Drying: By Evaporation—By Aeration—By Heating—By Ventilation—By Absorption—Glazes. Composition and Properties—Raw Materials—Manufacture and Application—Firing. Properties of the Bodies and Glazes during Firing—Description of the Kilns—Working of the Kilns—Decoration. Colouring Materials—Processes of Decoration.

Part II., Special Pottery Methods. Terra Cottas. Classification: Plain Ordinary, Hollow, Ornamental, Vitrified, and Light Bricks—Ordinary and Black Tiles—Paving Tiles—Pipes—Architectural Terra Cottas—Vases, Statues and Decorative Objects—Common Pottery—Pottery for Water and Filters—Tobacco Pipes—Lustre Ware—Properties and Tests for Terra Cottas—Fireclay Goods. Classification: Argillaceous, Aluminous, Carboniferous, Silicious and Basic Fireclay Goods—Fireclay Mortar (Pug)—Tests for Fireclay Goods—Faïences. Varnished Faïences—Enamelled Faïences—Silicious Faïences—Pipeclay Faïences—Pebble Work—Feldspathic Faïences—Composition, Processes of Manufacture and General Arrangements of Faïence Potteries—Stoneware. Stoneware Properly So-called: Paving Tiles—Pipes—Sanitary Ware—Stoneware for Food Purposes and Chemical Productions—Architectural Stoneware—Vases, Statues and other Decorative Objects—Fine Stoneware—Porcelain. Hard Porcelain for Table Ware and Decoration, for the Fire, for Electrical Conduits, for Mechanical Purposes; Architectural Porcelain, and Dull or Biscuit Porcelain—Soft Phosphated or English Porcelain—Soft Vitreous Porcelain, French and New Sèvres—Argillaceous Soft or Seger's Porcelain—Dull Soft or Parian Porcelain—Dull Feldspathic Soft Porcelain—**Index.**

ARCHITECTURAL POTTERY. Bricks, Tiles, Pipes, Enamelled Terra-cottas, Ordinary and Incrusted Quarries, Stoneware Mosaics, Faïences and Architectural Stoneware. By LEON LEFÈVRE. With Five Plates. 950 Illustrations in the Text, and numerous estimates. 500 pp., royal 8vo. 1900. Translated from the French by K. H. BIRD, M.A., and W. MOORE BINNS. Price 15s.; India and Colonies, 16s.; Other Countries, 17s. 6d.; strictly net.

Contents.

Part I. Plain Undecorated Pottery.—Clays, Bricks, Tiles, Pipes, Chimney Flues, Terra-cotta.

Part II. Made-up or Decorated Pottery.

THE ART OF RIVETING GLASS, CHINA AND EARTHENWARE. By J. HOWARTH. Second Edition. 1900. Paper Cover. Price 1s. net; by post, home or abroad, 1s. 1d.

HOW TO ANALYSE CLAY. Practical Methods for Practical Men. By HOLDEN M. ASHBY, Professor of Organic Chemistry, Harvey Medical College, U.S.A. 74 pp. Twenty Illus. 1901. Price 2s. 6d.; Abroad, 3s.; strictly net.

NOTES ON POTTERY CLAYS. Their Distribution, Properties, Uses and Analyses of Ball Clays, China Clays and China Stone. By JAS. FAIRIE, F.G.S. 1901. 132 pp. Crown 8vo. Price 3s. 6d.; India and Colonies, 4s.; Other Countries, 4s. 6d.; strictly net.

A Reissue of

THE HISTORY OF THE STAFFORDSHIRE POTTERIES; AND THE RISE AND PROGRESS OF THE MANUFACTURE OF POTTERY AND PORCELAIN. With References to Genuine Specimens, and Notices of Eminent Potters. By SIMEON SHAW. (Originally Published in 1829.) 265 pp. 1900. Demy 8vo. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Introductory Chapter showing the position of the Pottery Trade at the present time (1899)—Preliminary Remarks—The Potteries, comprising Tunstall, Brownhills, Greenfield and New Field, Golden Hill, Latebrook, Green Lane, Burslem, Longport and Dale Hall, Hot Lane and Cobridge, Hanley and Shelton, Etruria, Stoke, Penkhull, Fenton, Lane Delph, Foley, Lane End—On the Origin of the Art, and its Practice among the early Nations—Manufacture of Pottery, prior to 1700—The Introduction of Red Porcelain by Messrs Elers, of Bradwell, 1690—Progress of the Manufacture from 1700 to Mr. Wedgwood's commencement in 1760—Introduction of Fluid Glaze—Extension of the Manufacture of Cream Colour—Mr. Wedgwood's Queen's Ware—Jasper, and Appointment of Potter to Her Majesty—Black Printing—Introduction of Porcelain. Mr. W. Littler's Porcelain—Mr Cookworthy's Discovery of Kaolin and Petuntse, and Patent—Sold to Mr. Champion—resold to the New Hall Com.—Extension of Term—Blue Printed Pottery. Mr. Turner, Mr Spode (1), Mr. Baddeley, Mr. Spode (2), Messrs. Turner, Mr. Wood Mr. Wilson, Mr. Minton—Great Change in Patterns of Blue Printed—Introduction of Lustre Pottery. Improvements in Pottery and Porcelain subsequent to 1800.

A Reissue of

THE CHEMISTRY OF THE SEVERAL NATURAL AND ARTIFICIAL HETEROGENEOUS COMPOUNDS USED IN MANUFACTURING PORCELAIN, GLASS AND POTTERY. By SIMEON SHAW.

(Originally published in 1837.) 750 pp. 1900. Royal 8vo. Price 14s.; India and Colonies, 15s.; Other Countries, 16s. 6d.; strictly net.

Contents.

PART I., ANALYSIS AND MATERIALS.—Introduction: Laboratory and Apparatus Elements—Temperature—Acids and Alkalies—The Earths—Metals.

PART II., SYNTHESIS AND COMPOUNDS.—Science of Mixing—Bodies: Porcelain—Hard, Porcelain—Fritted Bodies, Porcelain—Raw Bodies, Porcelain—Soft, Fritted Bodies, Raw Bodies, Stone Bodies, Ironstone, Dry Bodies, Chemical Utensils, Fritted Jasper, Fritted Pearl, Fritted Drab, Raw Chemical Utensils, Raw Stone, Raw Jasper, Raw Pearl, Raw Mortar, Raw Drab, Raw Brown, Raw Fawn, Raw Cane, Raw Red Porous, Raw Egyptian, Earthenware, Queen's Ware, Cream Colour, Blue and Fancy Printed, Dipped and Mocha, Chalky, Rings, Stilts, etc.—Glazes: Porcelain—Hard Fritted Porcelain—Soft Fritted Porcelain—Soft Raw, Cream Colour Porcelain, Blue Printed Porcelain, Fritted Glazes, Analysis of Fritt, Analysis of Glaze, Coloured Glazes, Dips, Smears and Washes; Glasses: Flint Glass, Coloured Glasses, Artificial Garnet, Artificial Emerald, Artificial Amethyst, Artificial Sapphire, Artificial Opal, Plate Glass, Crown Glass, Broad Glass, Bottle Glass, Phosphoric Glass, British Steel Glass, Glass-Staining and Painting, Engraving on Glass, Dr. Faraday's Experiments—Colours: Colour Making, Fluxes or Solvents, Components of the Colours; Reds, etc., from Gold, Carmine or Rose Colour, Purple, Reds, etc., from Iron, Blues, Yellows, Greens, Blacks, White, Silver for Burnishing, Gold for Burnishing, Printer's Oil, Lustres.

TABLES OF THE CHARACTERISTICS OF CHEMICAL SUBSTANCES.

Glassware, Glass Staining and Painting.

RECIPES FOR FLINT GLASS MAKING. By a British Glass Master and Mixer. Sixty Recipes. Being Leaves from the Mixing Book of several experts in the Flint Glass Trade, containing up-to-date recipes and valuable information as to Crystal, Demi-crystal and Coloured Glass in its many varieties. It contains the recipes for cheap metal suited to pressing, blowing, etc., as well as the most costly crystal and ruby. Crown 8vo. 1900. Price for United Kingdom, 10s. 6d.; Abroad, 15s.; United States, \$4; strictly net.

Contents.

Ruby—Ruby from Copper—Flint for using with the Ruby for Coating—A German Metal—Cornelian, or Alabaster—Sapphire Blue—Crysophis—Opal—Turquoise Blue—Gold Colour—Dark Green—Green (common)—Green for Malachite—Blue for Malachite—Black for Malachite—Black—Common Canary Batch—Canary—White Opaque Glass—Sealing-wax Red—Flint—Flint Glass (Crystal and Demi)—Achromatic Glass—Paste Glass—White Enamel—Firestone—Dead White (for moons)—White Agate—Canary—Canary Enamel—Index.

A TREATISE ON THE ART OF GLASS PAINTING.

Prefaced with a Review of Ancient Glass. By ERNEST R. SUFFLING. With One Coloured Plate and Thirty-seven Illustrations. Demy 8vo. 140 pp. 1902. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d. net.

Contents.

A Short History of Stained Glass—Designing Scale Drawings—Cartoons and the Cut Line—Various Kinds of Glass Cutting for Windows—The Colours and Brushes used in Glass Painting—Painting on Glass, Dispersed Patterns—Diapered Patterns—Aciding—Firing—Fret Lead Glazing—Index.

PAINTING ON GLASS AND PORCELAIN AND ENAMEL PAINTING. A Complete Introduction to the Preparation of all the Colours and Fluxes used for Painting on Porcelain, Enamel, Faience and Stoneware, the Coloured Pastes and Coloured Glasses, together with a Minute Description of the Firing of Colours and Enamels. By FELIX HERMANN, Technical Chemist. With Eighteen Illustrations. 300 pp. Translated from the German second and enlarged Edition. 1897. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

History of Glass Painting—The Articles to be Painted: Glass, Porcelain, Enamel, Stoneware, Faience—Pigments: Metallic Pigments: Antimony Oxide, Naples Yellow, Barium Chromate, Lead Chromate, Silver Chloride, Chromic Oxide—Fluxes: Fluxes, Felspar, Quartz, Purifying Quartz, Sedimentation, Quenching, Borax, Boracic Acid, Potassium and Sodium Carbonates, Rocaille Flux—Preparation of the Colours for Glass Painting—The Colour Pastes—The Coloured Glasses—Composition of the Porcelain Colours—The Enamel Colours: Enamels for Artistic Work—Metallic Ornamentation: Porcelain Gilding, Glass Gilding—Firing the Colours: Remarks on Firing: Firing Colours on Glass, Firing Colours on Porcelain: The Muffle—Accidents occasionally Supervening during the Process of Firing—Remarks on the Different Methods of Painting on Glass, Porcelain, etc.—Appendix: Cleaning Old Glass Paintings.

Paper Staining.

THE DYEING OF PAPER PULP. A Practical Treatise for the use of Papermakers, Paperstainers, Students and others. By JULIUS ERFURT, Manager of a Paper Mill. Translated into English and Edited with Additions by JULIUS HÜBNER, F.C.S., Lecturer on Papermaking at the Manchester Municipal Technical School. With Illustrations and 157 patterns of paper dyed in the pulp. Royal 8vo, 180 pp. 1901. Price 15s.; India and Colonies, 16s.; Other Countries, 20s.; strictly net. Limited edition.

Contents.

Behaviour of the Paper Fibres during the Process of Dyeing, Theory of the Mordant—Colour Fixing Mediums (Mordants)—Influence of the Quality of the Water Used—Inorganic Colours—Organic Colours—Practical Application of the Coal Tar Colours according to their Properties and their Behaviour towards the Different Paper Fibres—Dyed Patterns on Various Pulp Mixtures—Dyeing to Shade—Index.

Enamelling on Metal.

ENAMELS AND ENAMELLING. For Enamel Makers, Workers in Gold and Silver, and Manufacturers of Objects of Art. By PAUL RANDAU. Translated from the German. With Sixteen Illustrations. Demy 8vo. 180 pp. 1900. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

Composition and Properties of Glass—Raw Materials for the Manufacture of Enamels—Substances Added to Produce Opacity—Fluxes—Pigments—Decolorising Agents—Testing the Raw Materials with the Blow-pipe Flame—Subsidiary Materials—Preparing the Materials for Enamel Making—Mixing the Materials—The Preparation of Technical Enamels, The Enamel Mass—Appliances for Smelting the Enamel Mass—Smelting the Charge—Composition of Enamel Masses—Composition of Masses for Ground Enamels—Composition of Cover Enamels—Preparing the Articles for Enamelling—Applying the Enamel—Firing the Ground Enamel—Applying and Firing the Cover Enamel or Glaze—Repairing Defects in Enamelled Ware—Enamelling Articles of Sheet Metal—Decorating Enamelled Ware—Specialities in Enamelling—Dial-plate Enamelling—Enamels for Artistic Purposes, Recipes for Enamels of Various Colours—Index.

THE ART OF ENAMELLING ON METAL. By W. NORMAN BROWN. Twenty-eight Illustrations. Crown 8vo. 60 pp. 1900. Price 2s. 6d.; Abroad, 3s.; strictly net.

Silk Manufacture.

SILK THROWING AND WASTE SILK SPINNING.

By HOLLINS RAYNER. Demy 8vo. 170 pp. 117 illus. 1903. Price 5s.; Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

The Silkworm—Cocoon Reeling and Qualities of Silk—Silk Throwing—Silk Wastes—The Preparation of Silk Waste for Degumming—Silk Waste Degumming, Schapping and Discharging—The Opening and Dressing of Wastes—Silk Waste "Drawing" or "Preparing" Machinery—Long Spinning—Short Spinning—Spinning and Finishing Processes—Utilisation of Waste Products—Noil Spinning—Exhaust Noil Spinning.

Books on Textile and Dyeing Subjects.

THE CHEMICAL TECHNOLOGY OF TEXTILE

FIBRES: Their Origin, Structure, Preparation, Washing, Bleaching, Dyeing, Printing and Dressing. By Dr. GEORG VON GEORGIEVICS. Translated from the German by CHARLES SALTER. 320 pp. Forty-seven illustrations. Royal 8vo. 1902. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s. net.

Contents.

The Textile Fibres—Washing, Bleaching, Carbonising—Mordants and Mordanting—Dyeing—Printing—Dressing and Finishing.

POWER-LOOM WEAVING AND YARN NUMBERING,

According to Various Systems, with Conversion Tables. Translated from the German of ANTHON GRUNER. **With Twenty-six Diagrams in Colours.** 150 pp. 1900. Crown 8vo. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Power-Loom Weaving in General. Various Systems of Looms—Mounting and Starting the Power-Loom. English Looms—Tappet or Treadle Looms—Dobbies—General Remarks on the Numbering, Reeling and Packing of Yarn—Appendix—Useful Hints. Calculating Warps—Weft Calculations—Calculations of Cost Price in Hanks.

TEXTILE RAW MATERIALS AND THEIR CONVERSION INTO YARNS.

(The Study of the Raw Materials and the Technology of the Spinning Process.) By JULIUS ZIPSER. Translated from German by CHARLES SALTER. 302 illustrations. 500 pp. Demy 8vo. 1901. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

PART I.—The Raw Materials Used in the Textile Industry.

MINERAL RAW MATERIALS. VEGETABLE RAW MATERIALS. ANIMAL RAW MATERIALS.

PART II.—The Technology of Spinning or the Conversion of Textile Raw Materials into Yarn.

SPINNING VEGETABLE RAW MATERIALS. Cotton Spinning—Installation of a Cotton Mill—Spinning Waste Cotton and Waste Cotton Yarns—Flax Spinning—Fine Spinning—Tow Spinning—Hemp Spinning—Spinning Hemp Tow String—Jute Spinning—Spinning Jute Line Yarn—Utilising Jute Waste.

PART III.—Spinning Animal Raw Materials.

Spinning Carded Woollen Yarn—Finishing Yarn—Worsted Spinning—Finishing Worsted Yarn—Artificial Wool or Shoddy Spinning—Shoddy and Mungo Manufacture—Spinning Shoddy and other Wool Substitutes—Spinning Waste Silk—Chappe Silk—Fine Spinning—Index.

THE TECHNICAL TESTING OF YARNS AND TEXTILE FABRICS. With Reference to Official Specifications. Translated from the German of Dr. J. HERZFELD. Second Edition. Sixty-nine Illustrations. 200 pp. Demy 8vo. 1902. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

Yarn Testing. Determining the Yarn Number—Testing the Length of Yarns—Examination of the External Appearance of Yarn—Determining the Twist of Yarn and Twist—Determination of Tensile Strength and Elasticity—Estimating the Percentage of Fat in Yarn—Determination of Moisture (Conditioning)—Appendix.

DECORATIVE AND FANCY TEXTILE FABRICS.

By R. T. LORD. Manufacturers and Designers of Carpets, Damask, Dress and all Textile Fabrics. 200 pp. 1898. Demy 8vo. 132 Designs and Illustrations. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

A Few Hints on Designing Ornamental Textile Fabrics—A Few Hints on Designing Ornamental Textile Fabrics (continued)—A Few Hints on Designing Ornamental Textile Fabrics (continued)—Hints for Ruled-paper Draughtsmen—The Jacquard Machine—Brussels and Wilton Carpets—Tapestry Carpets—Ingrain Carpets—Axminster Carpets—Damask and Tapestry Fabrics—Scarf Silks and Ribbons—Silk Handkerchiefs—Dress Fabrics—Mantle Cloths—Figured Plush—Bed Quilts—Calico Printing.

THEORY AND PRACTICE OF DAMASK WEAVING.

By H. KINZER and K. WALTER. Royal 8vo. Eighteen Folding Plates. Six Illustrations. Translated from the German. 110 pp. 1903. Price 8s. 6d.; Colonies, 9s.; Other Countries, 9s. 6d.; strictly net.

Contents.

The Various Sorts of Damask Fabrics—Drill (Ticking, Handloom-made)—Whole Damask for Tablecloths—Damask with Ground- and Connecting-warp Threads—Furniture Damask—Lampas or Hangings—Church Damasks—The Manufacture of Whole Damask—Damask Arrangement with and without Cross-Shedding—The Altered Cone-arrangement—The Principle of the Corner Lifting Cord—The Roller Principle—The Combination of the Jacquard with the so-called Damask Machine—The Special Damask Machine—The Combination of Two Tyings.

FAULTS IN THE MANUFACTURE OF WOOLLEN GOODS AND THEIR PREVENTION. By NICOLAS REISER. Translated from the Second German Edition. Crown 8vo.

Sixty-three Illustrations. 170 pp. 1903. Price 5s.; Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

Improperly Chosen Raw Material or Improper Mixtures—Wrong Treatment of the Material in Washing, Carbonisation, Drying, Dyeing and Spinning—Improper Spacing of the Goods in the Loom—Wrong Placing of Colours—Wrong Weight or Width of the Goods—Breaking of Warp and Weft Threads—Presence of Doubles, Singles, Thick, Loose, and too Hard Twisted Threads as well as Tangles, Thick Knots and the Like—Errors in Cross-weaving—Inequalities, i.e., Bands and Stripes—Dirty Borders—Defective Selvedges—Holes and Buttons—Rubbed Places—Creases—Spots—Loose and Bad Colours—Badly Dyed Selvedges—Hard Goods—Brittle Goods—Uneven Goods—Removal of Bands, Stripes, Creases and Spots.

SPINNING AND WEAVING CALCULATIONS, especially relating to Woollens. From the German of N. REISER. Thirty-four Illustrations. Tables. 160 pp. Demy 8vo. 1904. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

Calculating the Raw Material—Proportion of Different Grades of Wool to Furnish a Mixture at a Given Price—Quantity to Produce a Given Length—Yarn Calculations—Yarn Number—Working Calculations—Calculating the Reed Count—Cost of Weaving, etc.

WATERPROOFING OF FABRICS. By Dr. S. MIERZINSKI.
Crown 8vo. 104 pp. 29 Illus. 1903. Price 5s.; Colonies, 5s. 6d.;
Other Countries, 6s.; strictly net.

Contents.

Introduction—Preliminary Treatment of the Fabric—Waterproofing with Acetate of Alumina—Impregnation of the Fabric—Drying—Waterproofing with Paraffin—Waterproofing with Ammonium Cuprate—Waterproofing with Metallic Oxides—Coloured Waterproof Fabrics—Waterproofing with Gelatine, Tannin, Caseinate of Lime and other Bodies—Manufacture of Tarpaulin—British Waterproofing Patents—Index.

HOW TO MAKE A WOOLLEN MILL PAY. By JOHN
MACKIE. Crown 8vo. 76 pp. 1904. Price 3s. 6d.; Colonies, 4s.;
Other Countries, 4s. 6d.; net.

Contents.

Blends, Piles, or Mixtures of Clean Scoured Wools—Dyed Wool Book—The Order Book—Pattern Duplicate Books—Management and Oversight—Constant Inspection of Mill Departments—Importance of Delivering Goods to Time, Shade, Strength, etc.—Plums.
(For "Textile Soaps" see p. 7.)

Dyeing, Colour Printing, Matching and Dye-stuffs.

THE COLOUR PRINTING OF CARPET YARNS. Manual
for Colour Chemists and Textile Printers. By DAVID PATERSON,
F.C.S. Seventeen Illustrations. 136 pp. Demy 8vo. 1900. Price
7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Structure and Constitution of Wool Fibre—Yarn Scouring—Scouring Materials—Water for Scouring—Bleaching Carpet Yarns—Colour Making for Yarn Printing—Colour Printing Pastes—Colour Recipes for Yarn Printing—Science of Colour Mixing—Matching of Colours—"Hank" Printing—Printing Tapestry Carpet Yarns—Yarn Printing—Steaming Printed Yarns—Washing of Steamed Yarns—Aniline Colours Suitable for Yarn Printing—Glossary of Dyes and Dye-wares used in Wood Yarn Printing—Appendix.

THE SCIENCE OF COLOUR MIXING. A Manual intended for the use of Dyers, Calico Printers and Colour Chemists. By DAVID PATERSON, F.C.S. Forty-one Illustrations, **Five Coloured Plates, and Four Plates showing Eleven Dyed Specimens of Fabrics.** 132 pp. Demy 8vo. 1900. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Colour a Sensation; Colours of Illuminated Bodies; Colours of Opaque and Transparent Bodies; Surface Colour—Analysis of Light; Spectrum; Homogeneous Colours; Ready Method of Obtaining a Spectrum—Examination of Solar Spectrum; The Spectroscope and Its Construction; Colourists' Use of the Spectroscope—Colour by Absorption; Solutions and Dyed Fabrics; Dichroic Coloured Fabrics in Gaslight—Colour Primaries of the Scientist *versus* the Dyer and Artist; Colour Mixing by Rotation and Lye Dyeing; Hue, Purity, Brightness; Tints; Shades, Scales, Tones, Sad and Sombre Colours—Colour Mixing; Pure and Impure Greens, Orange and Violets; Large Variety of Shades from few Colours; Consideration of the Practical Primaries: Red, Yellow and Blue—Secondary Colours; Nomenclature of Violet and Purple Group; Tints and Shades of Violet; Changes in Artificial Light—Tertiary Shades; Broken Hues; Absorption Spectra of Tertiary Shades—Appendix: Four Plates with Dyed Specimens Illustrating Text—Index.

DYERS' MATERIALS: An Introduction to the Examination, Evaluation and Application of the most important Substances used in Dyeing, Printing, Bleaching and Finishing. By PAUL HEERMAN, Ph.D. Translated from the German by. A. C. WRIGHT, M.A. (Oxon.), B.Sc. (Lond.). Twenty-four Illustrations. Crown 8vo. 150 pp. 1901. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

COLOUR MATCHING ON TEXTILES. A Manual intended for the use of Students of Colour Chemistry, Dyeing and Textile Printing. By DAVID PATERSON, F.C.S. Coloured Frontispiece. Twenty-nine Illustrations and **Fourteen Specimens of Dyed Fabrics.** Demy 8vo. 132 pp. 1901. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Colour Vision and Structure of the Eye—Perception of Colour—Primary and Complementary Colour Sensations—Daylight for Colour Matching—Selection of a Good Pure Light—Diffused Daylight, Direct Sunlight, Blue Skylight, Variability of Daylight, etc., etc.—Matching of Hues—Purity and Luminosity of Colours—Matching Bright Hues—Aid of Tinted Films—Matching Difficulties Arising from Contrast—Examination of Colours by Reflected and Transmitted Lights—Effect of Lustre and Transparency of Fibres in Colour Matching—Matching of Colours on Velvet Pile—Optical Properties of Dye stuffs Dichroism. Fluorescence—Use of Tinted Mediums—Orange Film—Defects of the Eye—Yellowing of the Lens—Colour Blindness, etc.—Matching of Dyed Silk Trimmings and Linings and Bindings—Its Difficulties—Behaviour of Shades in Artificial Light—Colour Matching of Old Fabrics, etc.—Examination of Dyed Colours under the Artificial Lights—Electric Arc, Magnesium and Dufton, Gardner Lights, Welsbach, Acetylene, etc.—Testing Qualities of an Illuminant—Influence of the Absorption Spectrum in Changes of Hue under the Artificial Lights—Study of the Causes of Abnormal Modifications of Hue, etc.

COLOUR: A HANDBOOK OF THE THEORY OF COLOUR. By GEORGE H. HURST, F.C.S. **With Ten Coloured Plates** and Seventy-two Illustrations. 160 pp. Demy 8vo. 1900. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Colour and Its Production—Cause of Colour in Coloured Bodies—Colour Phenomena and Theories—The Physiology of Light—Contrast—Colour in Decoration and Design—Measurement of Colour.

Reissue of

THE ART OF DYEING WOOL, SILK AND COTTON.

Translated from the French of M. HELLOT, M. MACQUER and M. LE PILEUR D'APLIGNY. First Published in English in 1789. Six Plates. Demy 8vo. 446 pp. 1901. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

Part I., The Art of Dyeing Wool and Woollen Cloth, Stuffs, Yarn, Worsted, etc. Part II., The Art of Dyeing Silk. Part III., The Art of Dyeing Cotton and Linen Thread, together with the Method of Stamping Silks, Cottons, etc.

THE CHEMISTRY OF DYE-STUFFS. By Dr. GEORG VON GEORGIEVICS. Translated from the Second German Edition. 412 pp. Demy 8vo. 1903. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

Introduction—Coal Tar—Intermediate Products in the Manufacture of Dye-stuffs—The Artificial Dye-stuffs (Coal-tar Dyes)—Nitroso Dye-stuffs—Nitro Dye-stuffs—Azo Dye-stuffs—Substantive Cotton Dye-stuffs—Azoxy stilbene Dye stuffs—Hydrazones—Ketoneimides—Triphenylmethane Dye-stuffs—Rosolic Acid Dye-stuffs—Xanthene Dye-stuffs—Xanthone Dye-stuffs—Flavones—Oxyketone Dye-stuffs—Quinoline and Acridine Dye-stuffs—Quinonimide or Diphenylamine Dye-stuffs—The Azine Group: Eurhodines, Safranines and Indulines—Eurhodines—Safranines—Quinoxalines—Indigo—Dye-stuffs of Unknown Constitution—Sulphur or Sulphine Dye stuffs—Development of the Artificial Dye-stuff Industry—The Natural Dye-stuffs—Mineral Colours—Index.

THE DYEING OF COTTON FABRICS: A Practical Handbook for the Dyer and Student. By FRANKLIN BEECH, Practical Colourist and Chemist. 272 pp. Forty-four Illustrations of Bleaching and Dyeing Machinery. Demy 8vo. 1901. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Structure and Chemistry of the Cotton Fibre—Scouring and Bleaching of Cotton—Dyeing Machinery and Dyeing Manipulations—Principles and Practice of Cotton Dyeing—Direct Dyeing; Direct Dyeing followed by Fixation with Metallic Salts; Direct Dyeing followed by Fixation with Developers; Direct Dyeing followed by Fixation with Couplers; Dyeing on Tannic Mordant; Dyeing on Metallic Mordant; Production of Colour Direct upon Cotton Fibres; Dyeing Cotton by Impregnation with Dye-stuff Solution—Dyeing Union (Mixed Cotton and Wool) Fabrics—Dyeing Half Silk (Cotton-Silk, Satin) Fabrics—Operations following Dyeing—Washing, Soaping, Drying—Testing of the Colour of Dyed Fabrics—Experimental Dyeing and Comparative Dye Testing—Index.

The book contains numerous recipes for the production on Cotton Fabrics of all kinds of a great range of colours.

THE DYEING OF WOOLLEN FABRICS. By FRANKLIN BEECH, Practical Colourist and Chemist. Thirty-three Illustrations. Demy 8vo. 228 pp. 1902. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d. net.

Contents.

The Wool Fibre—Structure, Composition and Properties—Processes Preparatory to Dyeing—Scouring and Bleaching of Wool—Dyeing Machinery and Dyeing Manipulations—Loose Wool Dyeing, Yarn Dyeing and Piece Dyeing Machinery—The Principles and Practice of Wool Dyeing—Properties of Wool Dyeing—Methods of Wool Dyeing—Groups of Dyes—Dyeing with the Direct Dyes—Dyeing with Basic Dyes—Dyeing with Acid Dyes—Dyeing with Mordant Dyes—Level Dyeing—Blacks on Wool—Reds on Wool—Mordanting of Wool—Orange Shades on Wool—Yellow Shades on Wool—Green Shades on Wool—Blue Shades on Wool—Violet Shades on Wool—Brown Shades on Wool—Mode Colours on Wool—Dyeing Union (Mixed Cotton Wool) Fabrics—Dyeing of Gloria—Operations following Dyeing—Washing, Soaping, Drying—Experimental Dyeing and Comparative Dye Testing—Testing of the Colour of Dyed Fabrics—Index.

Bleaching and Washing.

A PRACTICAL TREATISE ON THE BLEACHING OF LINEN AND COTTON YARN AND FABRICS. By L. TAILFER, Chemical and Mechanical Engineer. Translated from the French by JOHN GEDDES MCINTOSH. Demy 8vo. 303 pp. Twenty Illusts. 1901. Price 12s. 6d.; India and Colonies, 13s. 6d.; Other Countries, 15s.; strictly net.

Contents.

General Considerations on Bleaching—Steeping—Washing: Its End and Importance—Roller Washing Machines—Wash Wheel (Dash Wheel)—Stocks or Wash Mill—Squeezing—Lye Boiling—Lye Boiling with Milk of Lime—Lye Boiling with Soda Lyes—Description of Lye Boiling Keirs—Operations of Lye Boiling—Concentration of Lyes—Mather and Platt's Keir—Description of the Keir—Saturation of the Fabrics—Alkali used in Lye Boiling—Examples of Processes—Soap—Action of Soap in Bleaching—Quality and Quantity of Soaps to use in the Lye—Soap Lyes or Scalds—Soap Scouring Stocks—Bleaching on Grass or on the Bleaching Green or Lawn—Chemicking—Remarks on Chlorides and their Decolourising Action—Chemicking Cisterns—Chemicking—Strengths, etc.—Sours—Properties of the Acids—Effects Produced by Acids—Souring Cisterns—Drying—Drying by Steam—Drying by Hot Air—Drying by Air—Damages to Fabrics in Bleaching—Yarn Mildew—Fermentation—Iron Rust Spots—Spots from Contact with Wood—Spots incurred on the Bleaching Green—Damages arising from the Machines—Examples of Methods used in Bleaching—Linen—Cotton—The Valuation of Caustic and Carbonated Alkali (Soda) and General Information Regarding these Bodies—Object of Alkalimetry—Titration of Carbonate of Soda—Comparative Table of Different Degrees of Alkalimetric Strength—Five Problems relative to Carbonate of Soda—Caustic Soda, its Properties and Uses—Mixtures of Carbonated and Caustic Alkali—Note on a Process of Manufacturing Caustic Soda and Mixtures of Caustic

and Carbonated Alkali (Soda)—Chlorometry—Titration—Wagner's Chlorometric Method—Preparation of Standard Solutions—Apparatus for Chlorine Valuation—Alkali in Excess in Decolourising Chlorides—Chlorine and Decolourising Chlorides—Synopsis—Chlorine—Chloride of Lime—Hypochlorite of Soda—Brochoki's Chlorozone—Various Decolourising Hypochlorites—Comparison of Chloride of Lime and Hypochlorite of Soda—Water—Qualities of Water—Hardness—Dervaux's Purifier—Testing the Purified Water—Different Plant for Purification—Filters—Bleaching of Yarn—Weight of Yarn—Lye Boiling—Chemicking—Washing—Bleaching of Cotton Yarn—The Installation of a Bleach Works—Water Supply—Steam Boilers—Steam Distribution Pipes—Engines—Keirs—Washing—Machines—Stocks—Wash Wheels—Chemicking and Souring Cisterns—Various—Buildings—Addenda—Energy of Decolourising Chlorides and Bleaching by Electricity and Ozone—Energy of Decolourising Chlorides—Chlorides—Production of Chlorine and Hypochlorites by Electrolysis—Lunge's Process for increasing the intensity of the Bleaching Power of Chloride of Lime—Trilfer's Process for Removing the Excess of Lime or Soda from Decolourising Chlorides—Bleaching by Ozone.

Cotton Spinning and Combing.

COTTON SPINNING (First Year). By THOMAS THORNLEY, Spinning Master, Bolton Technical School. 160 pp. Eighty-four Illustrations. Crown 8vo. 1901. Price 3s.; Abroad, 3s. 6d.; strictly net.

Contents.

Syllabus and Examination Papers of the City and Guilds of London Institute—Cultivation, Classification, Ginning, Baling and Mixing of the Raw Cotton—Bale-Breakers, Mixing Lattices and Hopper Feeders—Opening and Scutching—Carding—Indexes.

COTTON SPINNING (Intermediate, or Second Year). By THOMAS THORNLEY. 180 pp. Seventy Illustrations. Crown 8vo. 1901. Price 5s.; India and British Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

Syllabuses and Examination Papers of the City and Guilds of London Institute—The Combing Process—The Drawing Frame—Bobbin and Fly Frames—Mule Spinning—Ring Spinning—General Indexes.

COTTON SPINNING (Honours, or Third Year). By THOMAS THORNLEY. 216 pp. Seventy-four Illustrations. Crown 8vo. 1901. Price 5s.; India and British Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

Syllabuses and Examination Papers of the City and Guilds of London Institute—Cotton—The Practical Manipulation of Cotton Spinning Machinery—Doubling and Winding—Reeling—Warping—Production and Costs—Main Driving—Arrangement of Machinery and Mill Planning—Waste and Waste Spinning—Indexes.

COTTON COMBING MACHINES. By THOS. THORNLEY, Spinning Master, Technical School, Bolton. Demy 8vo. 117 Illustrations. 300 pp. 1902. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d. net.

Contents.

The Sliver Lap Machine and the Ribbon Cap Machine—General Description of the Heilmann Comber—The Cam Shaft—On the Detaching and Attaching Mechanism of the Comber—Resetting of Combers—The Erection of a Heilmann Comber—Stop Motions: Various Calculations—Various Notes and Discussions—Cotton Combing Machines of Continental Make—Index.

Collieries and Mines.

RECOVERY WORK AFTER PIT FIRES. By ROBERT LAMPRECHT, Mining Engineer and Manager. Translated from the German. Illustrated by Six large Plates, containing Seventy-six Illustrations. 175 pp., demy 8vo. 1901. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

Causes of Pit Fires—Preventive Regulations: (1) The Outbreak and Rapid Extension of a Shaft Fire can be most reliably prevented by Employing little or no Combustible Material in the Construction of the Shaft; (2) Precautions for Rapidly Localising an Outbreak of Fire in the Shaft; (3) Precautions to be Adopted in case those under 1 and 2 Fail or Prove Inefficient. **Precautions against Spontaneous Ignition of Coal.** Precautions for Preventing Explosions of Fire-damp and Coal Dust. Employment of Electricity in Mining, particularly in Fiery Pits. Experiments on the Ignition of Fire-damp Mixtures and Clouds of Coal Dust by Electricity—**Indications of an Existing or Incipient Fire—Appliances for Working in Irrespirable Gases:** Respiratory Apparatus; Apparatus with Air Supply Pipes; Reservoir Apparatus; Oxygen Apparatus—**Extinguishing Pit Fires:** (a) Chemical Means; (b) Extinction with Water. Dragging down the Burning Masses and Packing with Clay; (c) Insulating the Seat of the Fire by Dams. Dam Building. Analyses of Fire Gases. Isolating the Seat of a Fire with Dams; Working in Irrespirable Gases ("Gas-diving"); Air-Lock Work. Complete Isolation of the Pit. Flooding a Burning Section isolated by means of Dams. Wooden Dams; Masonry Dams. Examples of Cylindrical and Dome-shaped Dams. Dam Doors: Flooding the Whole Pit—**Rescue Stations:** (a) Stations above Ground; (b) Underground Rescue Stations—**Spontaneous Ignition of Coal in Bulk—Index.**

VENTILATION IN MINES. By ROBERT WABNER, Mining Engineer. Translated from the German. Royal 8vo. Thirty Plates and Twenty-two Illustrations. 240 pp. 1903. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; strictly net.

Contents.

The Causes of the Contamination of Pit Air—The Means of Preventing the Dangers resulting from the Contamination of Pit Air—Calculating the Volume of Ventilating Current necessary to free Pit Air from Contamination—Determination of the Resistance Opposed to the Passage of Air through the Pit—Laws of Resistance and Formulæ therefor—Fluctuations in the Temperament or Specific Resistance of a Pit—Means for Providing a Ventilating Current in the Pit—Mechanical Ventilation—Ventilators and Fans—Determining the Theoretical, Initial, and True (Effective) Depression of the Centrifugal Fan—New Types of Centrifugal Fan of Small Diameter and High Working Speed—Utilising the Ventilating Current to the utmost Advantage and distributing the same through the Workings—Artificially retarding the Ventilating Current—Ventilating Preliminary Workings—Blind Headings—Separate Ventilation—Supervision of Ventilation—INDEX.

HAULAGE AND WINDING APPLIANCES USED IN MINES. By CARL VOLK. Translated from the German. Royal 8vo. With Six Plates and 148 Illustrations. 150 pp. 1903. Price 8s. 6d.; Colonies, 9s.; Other Countries, 9s. 6d.; strictly net.

Contents.

Haulage Appliances—Ropes—Haulage Tubs and Tracks—Cages and Winding Appliances—Winding Engines for Vertical Shafts—Winding without Ropes—Haulage in Levels and Inclines—The Working of Underground Engines—Machinery for Downhill Haulage.

Dental Metallurgy.

DENTAL METALLURGY: MANUAL FOR STUDENTS AND DENTISTS. By A. B. GRIFFITHS, Ph.D. Demy 8vo. Thirty-six Illustrations. 1901. 200 pp. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Introduction—Physical Properties of the Metals—Action of Certain Agents on Metals—Alloys—Action of Oral Bacteria on Alloys—Theory and Varieties of Blowpipes—Fluxes—Furnaces and Appliances—Heat and Temperature—Gold—Mercury—Silver—Iron—Copper—Zinc—Magnesium—Cadmium—Tin—Lead—Aluminium—Antimony—Bismuth—Palladium—Platinum—Iridium—Nickel—Practical Work—Weights and Measures.

Engineering, Smoke Prevention and Metallurgy.

THE PREVENTION OF SMOKE. Combined with the Economical Combustion of Fuel. By W. C. POPPLEWELL, M.Sc., A.M.Inst., C.E., Consulting Engineer. Forty-six Illustrations. 190 pp. 1901. Demy 8vo. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d., strictly net.

Contents.

Fuel and Combustion—Hand Firing in Boiler Furnaces—Stoking by Mechanical Means—Powdered Fuel—Gaseous Fuel—Efficiency and Smoke Tests of Boilers—Some Standard Smoke Trials—The Legal Aspect of the Smoke Question—The Best Means to be adopted for the Prevention of Smoke—Index.

GAS AND COAL DUST FIRING. A Critical Review of the Various Appliances Patented in Germany for this purpose since 1885. By ALBERT PÜTSCH. 130 pp. Demy 8vo. 1901. Translated from the German. With 103 Illustrations. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Generators—Generators Employing Steam—Stirring and Feed Regulating Appliances—Direct Generators—Burners—Regenerators and Recuperators—Glass Smelting Furnaces—Metallurgical Furnaces—Pottery Furnace—Coal Dust Firing—Index.

THE HARDENING AND TEMPERING OF STEEL IN THEORY AND PRACTICE. By FRIDOLIN REISER. Translated from the German of the Third Edition. Crown 8vo. 120 pp. 1903. Price 5s.; India and British Colonies, 5s. 6d.; Other Countries, 6s.; strictly net.

Contents.

Steel—Chemical and Physical Properties of Steel, and their Casual Connection—Classification of Steel according to Use—Testing the Quality of Steel—Steel-Hardening—Investigation of the Causes of Failure in Hardening—Regeneration of Steel Spoilt in the Furnace—Welding Steel—Index.

SIDEROLGY: THE SCIENCE OF IRON (The Constitution of Iron Alloys and Slags). Translated from German of HANNS FREIHERR V. JÜPTNER. 350 pp. Demy 8vo. Eleven Plates and Ten Illustrations. 1902. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; net.

Contents.

The Theory of Solution.—Solutions—Molten Alloys—Varieties of Solutions—Osmotic Pressure—Relation between Osmotic Pressure and other Properties of Solutions—Osmotic Pressure and Molecular Weight of the Dissolved Substance—Solutions of Gases—Solid Solutions—Solubility—Diffusion—Electrical Conductivity—Constitution of Electrolytes and Metals—Thermal Expansion. **Micrography.**—Microstructure—The Micrographic Constituents of Iron—Relation between Micrographical Composition, Carbon-Content, and Thermal Treatment of Iron Alloys—The Microstructure of Slags. **Chemical Composition of the Alloys of Iron.**—Constituents of Iron Alloys—Carbon—Constituents of the Iron Alloys, Carbon—Opinions and Researches on Combined Carbon—Opinions and Researches on Combined Carbon—Applying the Curves of Solution deduced from the Curves of Recalescence to the Determination of the Chemical Composition of the Carbon present in Iron Alloys—The Constituents of Iron—Iron—The Constituents of Iron Alloys—Manganese—Remaining Constituents of Iron Alloys—A Silicon—Gases. **The Chemical Composition of Slag.**—Silicate Slags—Calculating the Composition of Silicate Slags—Phosphate Slags—Oxide Slags—Appendix—Index.

EVAPORATING, CONDENSING AND COOLING APPARATUS. Explanations, Formulae and Tables for Use in Practice. By E. HAUSBRAND, Engineer. Translated by A. C. WRIGHT, M.A. (Oxon.), B.Sc. (Lond.). With Twenty one Illustrations and Seventy-six Tables. 400 pp. Demy 8vo. 1903. Price 10s. 6d.; India and Colonies, 11s.; Other Countries, 12s.; net.

Contents.

ReCoefficient of Transmission of Heat, k , and the Mean Temperature Difference, θ_m —Parallel and Opposite Currents—Apparatus for Heating with Direct Fire—The Injection of Saturated Steam—Superheated Steam—Evaporation by Means of Hot Liquids—The Transference of Heat in General, and Transference by means of Saturated Steam in Particular—The Transference of Heat from Saturated Steam in Pipes (Coils) and Double Bottoms—Evaporation in a Vacuum—The Multiple-effect Evaporator—Multiple-effect Evaporators from which Extra Steam is Taken—The Weight of Water which must be Evaporated from 100 Kilos. of Liquor in order its Original Percentage of Dry Materials from 1-25 per cent. up to 20-70 per cent.—The Relative Proportion of the Heating Surfaces in the Elements of the Multiple Evaporator and their Actual Dimensions—The Pressure Exerted by Currents of Steam and Gas upon Floating Drops of Water—The Motion of Floating Drops of Water upon which Press Currents of Steam—The Splashing of Evaporating Liquids—The Diameter of Pipes for Steam, Alcohol, Vapour and Air—The Diameter of Water Pipes—The Loss of Heat from Apparatus and Pipes to the Surrounding Air, and Means for Preventing the Loss—Condensers—Heating Liquids by Means of Steam—The Cooling of Liquids—The Volumes to be Exhausted from Condensers by the Air-pumps—A Few Remarks on Air-pumps and the Vacua they Produce—The Volumetric Efficiency of Air-pumps—The Volumes of Air which must be Exhausted from a Vessel in order to Reduce its Original Pressure to a Certain Lower Pressure—Index.

Plumbing, Decorating, Metal Work, etc., etc.

EXTERNAL PLUMBING WORK. A Treatise on Lead Work for Roofs. By JOHN W. HART, R.P.C. 180 Illustrations. 272 pp. Demy 8vo. Second Edition Revised. 1902. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Cast Sheet Lead—Milled Sheet Lead—Roof Cesspools—Socket Pipes—Drips—Gutters—Gutters (continued)—Breaks—Circular Breaks—Flats—Flats (continued)—Rolls on Flats—Roll Ends—Roll Intersections—Seam Rolls—Seam Rolls (continued)—Tack Fixings—Step Flashings—Step Flashings (continued)—Secret Gutters—Soakers—Hip and Valley Soakers—Dormer Windows—Dormer Windows (continued)—Dormer Tops—Internal Dormers—Skylights—Hips and Ridging—Hips and Ridging (continued)—Fixings for Hips and Ridging—Ornamental Ridging—Ornamental Curb Rolls—Curb Rolls—Cornices—Towers and Finials—Towers and Finials (continued)—Towers and Finials (continued)—Domes—Domes (continued)—Ornamental Lead Work—Rain Water Heads—Rain Water Heads (continued)—Rain Water Heads (continued).

HINTS TO PLUMBERS ON JOINT WIPING, PIPE BENDING AND LEAD BURNING. Third Edition, Revised and Corrected. By JOHN W. HART, R.P.C. 184 Illustrations. 313 pp. Demy 8vo. 1901. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Pipe Bending—Pipe Bending (continued)—Pipe Bending (continued)—Square Pipe Bendings—Half-circular Elbows—Curved Bends on Square Pipe—Bossed Bends—Curved Plinth Bends—Rain-water Shoes on Square Pipe—Curved and Angle Bends—Square Pipe Fixings—Joint-wiping—Substitutes for Wiped Joints—Preparing Wiped Joints—Joint Fixings—Plumbing Irons—Joint Fixings—Use of "Touch" in Soldering—Underhand Joints—Blown and Copper Bit Joints—Branch Joints—Branch Joints (continued)—Block Joints—Block Joints (continued)—Block Fixings—Astragal Joints—Pipe Fixings—Large Branch Joints—Large Underhand Joints—Solders—Autogenous Soldering or Lead Burning—Index.

WORKSHOP WRINKLES for Decorators, Painters, Paper-hangers and Others. By W. N. BROWN. Crown 8vo. 128 pp. 1901. Price 2s. 6d.; Abroad, 3s.; strictly net.

SANITARY PLUMBING AND DRAINAGE. By JOHN W. HART. Demy 8vo. With 208 Illustrations. 250 pp. 1904. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Sanitary Surveys—Drain Testing—Drain Testing with Smoke—Testing Drains with Water—Drain Plugs for Testing—Sanitary Defects—Closets—Baths and Lavatories—House Drains—Manholes—Iron Soil Pipes—Lead Soil Pipes—Ventilating Pipes—Water-closets—Flushing Cisterns—Baths—Bath Fittings—Lavatories—Lavatory Fittings—Sinks—Waste Pipes—Water Supply—Ball Valves—Town House Sanitary Arrangements—Drainage—Joining Pipes—Accessible Drains—Iron Drains—Iron Junctions—Index.

THE PRINCIPLES AND PRACTICE OF DIPPING, BURNISHING, LACQUERING AND BRONZING BRASS WARE. By W. NORMAN BROWN. 35 pp. Crown 8vo. 1900. Price 2s.; Abroad, 2s. 6d.; strictly net.

HOUSE DECORATING AND PAINTING. By W. NORMAN BROWN. Eighty-eight Illustrations. 150 pp. Crown 8vo. 1900. Price 3s. 6d.; India and Colonies, 4s.; Other Countries, 4s. 6d.; strictly net.

A HISTORY OF DECORATIVE ART. By W. NORMAN BROWN. Thirty-nine Illustrations. 96 pp. Crown 8vo. 1900. Price 2s. 6d.; Abroad, 3s.; strictly net.

A HANDBOOK ON JAPANING AND ENAMELLING FOR CYCLES, BEDSTEADS, TINWARE, ETC. By WILLIAM NORMAN BROWN. 52 pp. and Illustrations. Crown 8vo. 1901. Price 2s.; Abroad, 2s. 6d.; net.

THE PRINCIPLES OF HOT WATER SUPPLY. By JOHN W. HART, R.P.C. With 129 Illustrations. 1900. 177 pp., demy 8vo. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Contents.

Water Circulation—The Tank System—Pipes and Joints—The Cylinder System—Boilers for the Cylinder System—The Cylinder System—The Combined Tank and Cylinder System—Combined Independent and Kitchen Boiler—Combined Cylinder and Tank System with Duplicate Boilers—Indirect Heating and Boiler Explosions—Pipe Boilers—Safety Valves—Safety Valves—The American System—Heating Water by Steam—Steam Kettles and Jets—Heating Power of Steam—Covering for Hot Water Pipes—Index.

Brewing and Botanical.

HOPS IN THEIR BOTANICAL, AGRICULTURAL AND TECHNICAL ASPECT, AND AS AN ARTICLE OF COMMERCE. By EMMANUEL GROSS, Professor at the Higher Agricultural College, Tetschen-Liebwerd. Translated from the German. Seventy-eight Illustrations. 1900. 340 pp. Demy 8vo. Price 12s. 6d.; India and Colonies, 13s. 6d.; Other Countries, 15s.; strictly net.

Contents.

HISTORY OF THE HOP—THE HOP PLANT—Introductory—The Roots—The Stem—and Leaves—Inflorescence and Flower: Inflorescence and Flower of the Male Hop; Inflorescence and Flower of the Female Hop—The Fruit and its Glandular Structure: The Fruit and Seed—Propagation and Selection of the Hop—Varieties of the Hop: (a) Red Hops; (b) Green Hops; (c) Pale Green Hops—Classification according to the Period of Ripening: Early August Hops; Medium Early Hops; Late Hops—Injuries to Growth—Leaves Turning Yellow, Summer or Sunbrand, Cones Dropping Off, Honey Dew, Damage from Wind, Hail

and Rain; Vegetable Enemies of the Hop: Animal Enemies of the Hop—Beneficial Insects on Hops—**CULTIVATION**—The Requirements of the Hop in Respect of Climate, Soil and Situation: Climate; Soil; Situation—Selection of Variety and Cuttings—Planting a Hop Garden: Drainage: Preparing the Ground: Marking-out for Planting; Planting; Cultivation and Cropping of the Hop Garden in the First Year—Work to be Performed Annually in the Hop Garden: Working the Ground; Cutting; The Non-cutting System; The Proper Performance of the Operation of Cutting: Method of Cutting: Close Cutting, Ordinary Cutting, The Long Cut, The Topping Cut; Proper Season for Cutting: Autumn Cutting, Spring Cutting; Manuring; Training the Hop Plant: Poled Gardens, Frame Training; Principal Types of Frames: Pruning, Cropping, Topping, and Leaf Stripping the Hop Plant; Picking, Drying and Bagging—Principal and Subsidiary Utilisation of Hops and Hop Gardens—Life of a Hop Garden; Subsequent Cropping—Cost of Production, Yield and Selling Prices.

Preservation and Storage—Physical and Chemical Structure of the Hop Cone—Judging the Value of Hops.

Statistics of Production—The Hop Trade—Index.

Timber and Wood Waste.

TIMBER: A Comprehensive Study of Wood in all its Aspects (Commercial and Botanical), showing the Different Applications and Uses of Timber in Various Trades, etc. Translated from the French of PAUL CHARPENTIER. Royal 8vo. 437 pp. 178 Illustrations. 1902. Price 12s. 6d.; India and Colonies, 13s. 6d.; Other Countries, 15s.; net.

Contents.

Physical and Chemical Properties of Timber—Composition of the Vegetable Bodies—Chief Elements—M. Fremy's Researches—Elementary Organs of Plants and especially of Forests—Different Parts of Wood Anatomically and Chemically Considered—General Properties of Wood—**Description of the Different Kinds of Wood**—Principal Essences with Caducous Leaves—Coniferous Resinous Trees—**Division of the Useful Varieties of Timber in the Different Countries of the Globe**—European Timber—African Timber—Asiatic Timber—American Timber—Timber of Oceania—**Forests**—General Notes as to Forests; their Influence—Opinions as to Sylviculture—Improvement of Forests—Unwooding and Rewooding—Preservation of Forests—Exploitation of Forests—Damage caused to Forests—Different Alterations—**The Preservation of Timber**—Generalities—Causes and Progress of Deterioration—History of Different Proposed Processes—Dessication—Superficial Carbonisation of Timber—Processes by Immersion—Generalities as to Antiseptics Employed—Injection Processes in Closed Vessels—The Boucherie System, Based upon the Displacement of the Sap—Processes for Making Timber Uninflammable—**Applications of Timber**—Generalities—Working Timber—Paving—Timber for Mines—Railway Traverses—Accessory Products—Gums—Works of M. Fremy—Resins—Barks—Tan—Application of Cork—The Application of Wood to Art and Dyeing—Different Applications of Wood—Hard Wood—Distillation of Wood—Pyroligneous Acid—Oil of Wood—Distillation of Resins—Index.

THE UTILISATION OF WOOD WASTE. Translated from the German of ERNST HUBBARD. Crown 8vo. 192 pp. 1902. Fifty Illustrations. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; net.

Contents.

General Remarks on the Utilisation of Sawdust—Employment of Sawdust as Fuel, with and without Simultaneous Recovery of Charcoal and the Products of Distillation—Manufacture of Oxalic Acid from Sawdust—Process with Soda Lye; Thorn's Process; Bohlig's Process—Manufacture of Spirit (Ethyl Alcohol) from Wood Waste—Patent Dyes (Organic Sulphides, Sulphur Dyes, or Mercapto Dyes)—Artificial Wood and Plastic Compositions from Sawdust—Production of Artificial Wood Compositions for Moulded Decorations—Employment of Sawdust for Blasting Powders and Gunpowders—Employment of Sawdust for Briquettes—Employment of Sawdust in the Ceramic Industry and as an Addition to Mortar—Manufacture of Paper Pulp from Wood—Casks—Various Applications of Sawdust and Wood Refuse—Calcium Carbide—Manure—Wood Mosaic Plaques—Bottle Stoppers—Parquetry—Fire-lighters—Carborundum—The Production of Wood Wool—Bark—Index.

Building and Architecture.

THE PREVENTION OF DAMPNES IN BUILDINGS;

with Remarks on the Causes, Nature and Effects of Saline, Efflorescences and Dry-rot, for Architects, Builders, Overseers, Plasterers, Painters and House Owners. By ADOLF WILHELM KEIM. Translated from the German of the second revised Edition by M. J. SALTER, F.I.C., F.C.S. Eight Coloured Plates and Thirteen Illustrations. Crown 8vo. 115 pp. 1902. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; net.

Contents.

The Various Causes of Dampness and Decay of the Masonry of Buildings, and the Structural and Hygienic Evils of the Same—Precautionary Measures during Building against Dampness and Efflorescence—Methods of Remedying Dampness and Efflorescences in the Walls of Old Buildings—The Artificial Drying of New Houses, as well as Old Damp Dwellings, and the Theory of the Hardening of Mortar—New, Certain and Permanently Efficient Methods for Drying Old Damp Walls and Dwellings—The Cause and Origin of Dry-rot: its Injurious Effect on Health, its Destructive Action on Buildings, and its Successful Repression—Methods of Preventing Dry-rot to be Adopted During Construction—Old Methods of Preventing Dry-rot—Recent and More Efficient Remedies for Dry-rot—Index.

HANDBOOK OF TECHNICAL TERMS USED IN ARCHITECTURE AND BUILDING, AND THEIR ALLIED TRADES AND SUBJECTS. By AUGUSTINE C. PASSMORE.

Demy 8vo. 380 pp. 1904. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net.

Foods and Sweetmeats.

THE MANUFACTURE OF PRESERVED FOODS AND SWEETMEATS. By A. HAUSNER. With Twenty-eight

Illustrations. Translated from the German of the third enlarged Edition. Crown 8vo. 225 pp. 1902. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; net.

Contents.

The Manufacture of Conserves—Introduction—The Causes of the Putrefaction of Food—The Chemical Composition of Foods—The Products of Decomposition—The Causes of Fermentation and Putrefaction—Preservative Bodies—The Various Methods of Preserving Food—The Preservation of Animal Food—Preserving Meat by Means of Ice—The Preservation of Meat by Charcoal—Preservation of Meat by Drying—The Preservation of Meat by the Exclusion of Air—The Appert Method—Preserving Flesh by Smoking—Quick Smoking—Preserving Meat with Salt—Quick Salting by Air Pressure—Quick Salting by Liquid Pressure—Gamble's Method of Preserving Meat—The Preservation of Eggs—Preservation of White and Yolk of Egg—Milk Preservation—Condensed Milk—The Preservation of Fat—Manufacture of Soup Tablets—Meat Biscuits—Extract of Beef—The Preservation of Vegetable Foods in General—Compressing Vegetables—Preservation of Vegetables by Appert's Method—The Preservation of Fruit—Preservation of Fruit by Storage—The Preservation of Fruit by Drying—Drying Fruit by Artificial Heat—Roasting Fruit—The Preservation of Fruit with Sugar—Boiled Preserved Fruit—The Preservation of Fruit in Spirit, Acetic Acid or Glycerine—Preservation of Fruit without Boiling—Jam Manufacture—The Manufacture of Fruit Jellies—The Making of Gelatine Jellies—The Manufacture of "Sulzen"—The Preservation of Fermented Beverages—The Manufacture of Candies—Introduction—The Manufacture of Candied Fruit—The Manufacture of Boiled Sugar and Caramel—The Candying of Fruit—Caramelised Fruit—The Manufacture of Sugar Sticks, or Barley Sugar—Bonbon Making—Fruit Drops—The Manufacture of Dragées—The Machinery and Appliances used in Candy Manufacture—Dyeing Candies and Bonbons—Essential Oils used in Candy Making—Fruit Essences—The Manufacture of Filled Bonbons, Liqueur Bonbons and Stamped Lozenges—Recipes for Jams and Jellies—Recipes for Bonbon Making—Dragées—Appendix—Index.

Dyeing Fancy Goods.

THE ART OF DYEING AND STAINING MARBLE, ARTIFICIAL STONE, BONE, HORN, IVORY AND WOOD, AND OF IMITATING ALL SORTS OF WOOD. A Practical Handbook for the Use of Joiners, Turners, Manufacturers of Fancy Goods, Stick and Umbrella Makers, Comb Makers, etc. Translated from the German of D. H. SOXHLET, Technical Chemist. Crown 8vo. 168 pp. 1902. Price 5s.; India and Colonies, 5s. 6d.; Other Countries, 6s.; net.

Contents.

Mordants and Stains—Natural Dyes—Artificial Pigments—Coal Tar Dyes—Staining Marble and Artificial Stone—Dyeing, Bleaching and Imitation of Bone, Horn and Ivory—Imitation of Tortoiseshell for Combs: Yellows, Dyeing Nuts—Ivory—Wood Dyeing—Imitation of Mahogany: Dark Walnut, Oak, Birch-Bark, Elder-Marquetry, Walnut, Walnut-Marquetry, Mahogany, Spanish Mahogany, Palisander and Rose Wood, Tortoiseshell, Oak, Ebony, Pear Tree—Black Dyeing Processes with Penetrating Colours—Varnishes and Polishes: English Furniture Polish, Vienna Furniture Polish, Amber Varnish, Copal Varnish, Composition for Preserving Furniture—Index.

Lithography, Printing and Engraving.

PRACTICAL LITHOGRAPHY. By ALFRED SEYMOUR. Demy 8vo. With Frontispiece and 33 Illus. 120 pp. 1903. Price 5s.; Colonies, 5s. 6d.; Other Countries, 6s.; net.

Contents.

Stones—Transfer Inks—Transfer Papers—Transfer Printing—Litho Press—Press Work—Machine Printing—Colour Printing—Substitutes for Lithographic Stones—Tin Plate Printing and Decoration—Photo-Lithography.

PRINTERS' AND STATIONERS' READY RECKONER AND COMPENDIUM. Compiled by VICTOR GRAHAM. Crown 8vo. 112 pp. 1904. Price 3s. 6d.; India and Colonies, 4s.; Other Countries, 4s. 6d.; strictly net, post free.

Contents.

Price of Paper per Sheet, Quire, Ream and Lb.—Cost of 100 to 1000 Sheets at various Sizes and Prices per Ream—Cost of Cards—Quantity Table—Sizes and Weights of Paper, Cards, etc.—Notes on Account Books—Discount Tables—Sizes of spaces—Leads to a lb.—Dictionary—Measure for Bookwork—Correcting Proofs, etc.

ENGRAVING FOR ILLUSTRATION. HISTORICAL AND PRACTICAL NOTES. By J. KIRKBRIDE. 72 pp. Two Plates and 6 Illustrations. Crown 8vo. 1903. Price 2s. 6d.; Abroad, 3s.; strictly net.

Contents.

Its Inception—Wood Engraving—Metal Engraving—Engraving in England—Etching—Mezzotint—Photo-Process Engraving—The Engraver's Task—Appreciative Criticism—Index.

Bookbinding.

PRACTICAL BOOKBINDING. By PAUL ADAM. Translated from the German. Crown 8vo. 180 pp. 127 Illustrations. 1903. Price 5s.; Colonies, 5s. 6d.; Other Countries, 6s.; net.

Contents.

Materials for Sewing and Pasting—Materials for Covering the Book—Materials for Decorating and Finishing—Tools—General Preparatory Work—Sewing—Forwarding, Cutting, Rounding and Backing—Forwarding, Decoration of Edges and Headbanding—Boarding—Preparing the Cover—Work with the Blocking Press—Treatment of Sewn Books, Fastening in Covers, and Finishing Off—Handtooling and Other Decoration—Account Books—School Books, Mounting Maps, Drawings, etc.—Index.

Sugar Refining.

THE TECHNOLOGY OF SUGAR: Practical Treatise on the Modern Methods of Manufacture of Sugar from the Sugar Cane and Sugar Beet. By JOHN GEDDES MCINTOSH. Demy 8vo. 83 Illustrations. 420 pp. Seventy-six Tables. 1903. Price 10s. 6d.; Colonies, 11s.; Other Countries, 12s.; net.

(See "*Evaporating, Condensing, etc., Apparatus*," p. 27.)

Contents.

Chemistry of Sucrose, Lactose, Maltose, Glucose, Invert Sugar, etc.—Purchase and Analysis of Beets—Treatment of Beets—Diffusion—Filtration—Concentration—Evaporation—**Sugar Cane:** Cultivation—Milling—Diffusion—Sugar Refining—Analysis of Raw Sugars—Chemistry of Molasses, etc.

Bibliography.

CLASSIFIED GUIDE TO TECHNICAL AND COMMERCIAL BOOKS. Compiled by EDGAR GREENWOOD.

Demy 8vo. 224 pp. 1904. Being a Subject-list of the Principal British and American Books in print; giving Title, Author, Size, Date, Publisher and Price. Price 7s. 6d.; India and Colonies, 8s.; Other Countries, 8s. 6d.; strictly net, post free.

Contents.

1. Agriculture and Farming—Agricultural Chemistry—Bee-keeping—Cattle, Pigs, Sheep—Dairy and Dairy Work—Feeding Animals—Forestry—Fruit Growing—Irrigation—Manures—Poultry Farming. 2. Air, Aerial Navigation. 3. Architecture and Building. 4. Art—Lettering—Modelling—Ornament—Painting—Perspective. 5. Arts and Crafts, Amateur Work. 6. Auction Sales. 7. Banking. 8. Book and Newspaper Production, Paper-making, Printing—Bookbinding—Bookselling—Copyright—Journalism—Lithography—Paper-making—Printing, Typography—Process Work—Stationery. 9. Brewing and Distilling. 10. Cabinet-making. 11. Calculators, Ready Reckoners, Discount Tables. 12. Carpentry and Joinery. 13. Chemicals, Chemistry. 14. Coachbuilding. 15. Commerce, Business. 16. Dams, Docks, Harbours. 17. Dogs. 18. Domestic Economy—Cookery—Dressmaking—Laundry—Millinery. 19. Electricity—Alternating Currents—Dynamoes—Electric Heating—Electric Lighting—Electric Traction—Telegraphy—Telephones—Wireless Telegraphy. 20. Elocution, Voice Production. 21. Engineering and Metal Work—Architectural Engineering—Blacksmithing—Boilers—Bridges—Civil Engineering—Fuel, Smoke—Galvanising, Tinning—Gas, Oil and Air Engines—Hardware—Hydraulic Engineering—Indicators—Injectors—Iron and Steel—Ironfounding—Lathes, Tools—Locomotives—Machine Construction and Design—Marine Engineering—Mechanical Engineering—Metal Work—Pattern Making—Pipes—Power Transmission—Pumps—Refrigeration—Saw Filing—Screw Cutting—Steam Engine—Strains and Stresses—Turbines. 22. Factories and Workshops. 23. Financial—Investments—Stockbroking. 24. Foods and Beverages—Adulteration and Analysis—Bread—Cakes—Fish—Flour, Grain—Food and Drug Acts—Tea. 25. Foreign Exchange Tables, Metric System. 26. Foreign Languages. 27. Gardening, Flowers. 28. Gas—Acetylene—Gas Fitting—Gas Lighting and Supply. 29. Glass. 30. Glues, Inks, Pastes. 31. Horses. 32. Hospitals, Nursing. 33. House Decoration. 34. Hygiene, Public Health—Bacteriology—Hygiene—Public Health—Sanitary Inspection—Sewage and Sewerage. 35. India-Rubber. 36. Insurance. 37. Jewellery, Silver and Goldsmith's Work. 38. Land, Property. 39. Leather Trades. 40. Legal—Arbitration—Bankruptcy Law—Commercial Law—Contract Law—Solicitors—Stamp Duties—Trustee Law—Wills. 41. Metallurgy. 42. Military. 43. Mining, Quarrying. 44. Motor Cars and Cycles. 45. Music. 46. Nautical, Navigation. 46a. Navy. 47. Oils, Fats. 48. Optical, Microscopy, Instruments. 49. Paints, Colours, Varnishes. 50. Patents, Trade Marks. 51. Photography. 52. Physics. 53. Physical Training. 54. Plumbing, Heating, Ventilation. 55. Pottery, China, Bricks. 56. Public Meetings, Elections, Taxes. 57. Railways and Tramways—Construction of Railways—Carriage and Wagon Building—Law of Railways—Light Railways—Management. 58. Rivers, Canals. 59. Roads, Highways. 60. Shopkeeping, Ticket Writing. 61. Shorthand, Typewriting. 62. Soaps, Candles. 63. Building, Co-operative and Friendly Societies. 64. Surveying. 65. Teaching, Education. 66. Telegraph Codes. 67. Textile Trades. 68. Timber. 69. Veterinary. 70. Watches, Clocks. 71. Water. Subject Index.

SCOTT, GREENWOOD & Co. will forward these Books, *post free*, upon receipt of remittance at the published price, or they can be obtained through all Booksellers.

Full List of Contents of any of the books will be sent on application.

SCOTT, GREENWOOD & CO.,
Technical Book Publishers,
19 LUDGATE HILL, LONDON, E.C.

University of California
SOUTHERN REGIONAL LIBRARY FACILITY
405 Hilgard Avenue, Los Angeles, CA 90024-1388
Return this material to the library
from which it was borrowed.

UC SOUTHERN REGIONAL LIBRARY FACILITY



A 000 606 965 2

Un

S